

**WEST**

Generate Collection

Print



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TITLE: Method and apparatus for composing digital medical imagery

Abstract Text (1):

A process for translating a set of point and click operations in a window oriented environment into a set of ACR-NEMA commands for formatting film pages of medical images. In particular, the software modules that comprise the invention relate to processes for interfacing a non-programmer user with a digital computer to produce a desired group of medical images, selected from stored images. The new group of images can be edited, annotated, and arranged by the user. The process then converts the image data into an industry standard format which can be transmitted to printers or storage on a network. A process for automatically generating a set of ACR-NEMA commands for formatting film pages of medical images, based upon the intrinsic characteristics of the images, defined as a set of ACR-NEMA elements.

Brief Summary Text (42):

Modern hospitals and diagnostic clinics use medical imagery workstations to acquire, study, and store in archives digitized medical imagery derived from a variety of source devices or modalities. Presently many medical imagery source devices connect directly to dedicated readers, printers, and storage devices. Multiple imagery source devices may be connected via hospital information networks to output devices such as workstations, laser film printers, or optical storage devices. Dedicated imagery handling devices, however, may quickly become obsolete in the context of today's environment of rapidly changing computing technology.

Brief Summary Text (44):

Recent advances in computer graphics technology and enhancements in the manipulation and transmission of digital imagery data have failed to meet the needs of imagery data presentation in hospitals. Applications utilizing these recent advances are overly restrictive, allowing very little freedom and versatility. More flexible systems on the other hand, typically demand more operator intervention. Such systems require the operator to learn and remember an unwieldy set of command sequences and decision paths.

Brief Summary Text (47):

Most conventional systems do not use pointer devices, soft keys or special function keys. There is no capability provided for customizing the conventional system for user or situation preferences. Work patterns are thus strictly defined and cannot be modified by the user. Modification requires alteration of the underlying computer program. Moreover, conventional user interfaces are not organized by user tasks. Conventional pull-down menu systems generally require a workstation operator to go through a long and tedious series of choices selected from a long list in a seemingly illogical hierarchy.

Brief Summary Text (48):

Although, conventional menu systems do not require operators to become familiar with all possible command key words and parameter values, conventional menu systems perform more slowly than text oriented command line entry systems. Menu systems can require hundreds of combinations of valid input values and provide numerous opportunities for invalid inputs. Conventional menus can require excessive time to sequence through the multiple levels of command pull-down menus. Thus, conventional menu item selection can be problematic as it requires excessive time, thought, and mental recall that lead to operator errors. Errors cannot be tolerated in life threatening situations. In many instances, medical imagery is critical and necessary for immediate diagnosis. Time is of the essence when human life is at stake and the associated tensions can be high. There is no time for mistake or delay. It is therefore necessary to have a quick and

simple operator interface to manipulate medical imagery.

Brief Summary Text (50):

Moreover, workstation operators while experts in their chosen medical field, are often not computer-literate. These operators (hospital technologists, radiologists, attending or consulting physicians) typically focus on the tasks of accessing, viewing, displaying, and printing medical imagery. Operators select a patient's images to compose and study for medical diagnosis. Operators select imagery and may choose to print, store or edit and annotate the imagery. Thus a simple and fast interface is needed to help increase speed, provide for an efficient work flow, and facilitate use by the non-computer-literate operators.

Brief Summary Text (53):

It is another object of the present invention to provide controls which are unambiguous and intelligible. It is another object of the present invention to display only information relevant to the task at hand. It is yet another object of the present invention to provide windows which allow manipulation of stacks of imagery work to act the same as if the images were laid on a desk top. It is another object of the present invention to provide an uncluttered display at the workstation. It is yet another object of the present invention to provide data input via mouse, soft keys, special function keys and other user input devices. It is another object of the present invention to provide an interface to multiple vendors' printers, both locally and remotely. It is another object of the present invention to provide the ability for a non-computer-literate workstation operator to easily choose, arrange, annotate, and edit medical source imagery.

Brief Summary Text (54):

It is another object of the present invention to provide a method for communicating with the operator and controlling the layout of selected patient images to be arranged within the workstation window. It is another object of the present invention to provide a method to create medical imagery printer parameters and to create American College of Radiology--National Electrical Manufacture's Association (ACR-NEMA) commands from these parameters. It is another object of the present invention to gather specific user input operations within dialog boxes. It is another object of the present invention to provide sealed and matching fonts for external devices. It is another object of the invention to provide management functions to perform, define, and maintain frame information within the workstation imagery composition window.

Brief Summary Text (55):

It is another object of the present invention to provide functions to select a printer, to change default printing and display parameters, to verify proper printer selection, and to control printing of imagery data from the workstation. It is another object of the present invention to provide custom scout lines in imagery windows. It is another object of the present invention to provide functions to access and manipulate stored text template information. It is another object of the present invention to provide the ability to print composed medical images on a variety of different vendors' laser film printers. It is another object of the invention to transmit composed medical images in an industry standard communication format. It is another object of the invention to provide a display of a simulated work place via a graphics user interface thus providing a combination of computer simulated tools to replace manual radiology techniques. It is another object of the invention to integrate critical decision activities.

Brief Summary Text (58):

In one aspect of the present invention, a method is presented for editing medical diagnostic imagery comprising the steps of: loading a medical diagnostic image to a workstation; presenting a set of graphic user interface commands at the workstation to allow an operator to edit the medical diagnostic image by manipulation of image objects; accepting and processing said graphic user interface commands upon selection by an operator at said workstation; transforming said operator selected graphic user interface input commands into a set of commands for formatting medical diagnostic imagery; and transmitting said set of transformed commands over a network for printing, display, or storage of said edited imagery.

Brief Summary Text (63):

In another aspect of the invention, an apparatus is presented for editing medical diagnostic imagery comprising: a medical diagnostic image a workstation; a means for presenting a set of graphic user interface commands on the workstation to allow an operator to edit the medical diagnostic image by manipulation of image objects; a means

for accepting and processing said graphic user interface commands upon selection by an operator at said workstation; a means for transforming said operator input commands into a set of command for formatting medical diagnostic imagery; and a means for transmitting said set of transformed commands over a network for printing, display or storage.

Drawing Description Text (14):

FIG. 13 illustrates how the PCW frame display is made from annotation data and image data in an example of a preferred embodiment of the present invention.

Drawing Description Text (20):

FIGS. 19A-19E illustrates a sample template definition, with descriptions of each data type in an example of a preferred embodiment of the present invention.

Detailed Description Text (5):

In a preferred embodiment, the PDS workstation is located in a critical care area and a medical image film formatter is located in a radiological department for printing images on film. The workstation and formatter are linked via an electronic network to provide image capture and retrieval, image enhancement, soft copy display, and film printing. Images can be previewed and adjusted at the workstation before printing. The workstation displays the image as it will look when printed. Thus, in a preferred embodiment, the workstation display is a "what you see is what you get" ("WYSIWYG") display. Workstation operators can view imagery, compose, and start printing before leaving a critical care area instead of waiting until return to the radiology department to process the film. Workstation operations, editing, viewing and composing and printing focus on the presentation and annotation of medical imagery. The operator is unaware of the underlying apparatus and method which comprises the preferred embodiment of the present invention.

Detailed Description Text (6):

A workstation operator does not have to "stop and think" about operating the PCW controls, but can maintain a high level of concentration in critical or life threatening situations. A preferred embodiment of the present invention provides a simulated view of medical images that resembles actual film images on a real viewing frame or desk space. The operator manipulates and edits the images using a computer simulation of a radiologist's light table at the workstation. Like a real workshop, a preferred embodiment provides an operator with several kinds of visual feedback. The operator sees the operation taking place, action upon single or multiple images or objects, pointer and target positions, and highlighting of selected options. Tasks are accomplished by interacting with a combination of graphic user interfaces.

Detailed Description Text (8):

It may be initially helpful to provide some operational examples of the preferred embodiment. These examples include two modes of the preferred embodiment: the Auto Print and Print Composition Workshop operating modes, both of which generate composed PCW documents and submit them to the print routines for printing. Initially, an operator at a PDS workstation uses PDS to recall and open patient ties stored in local PDS memory. The operator may then choose either of the PCW modes, Auto Print or PCW.

Detailed Description Text (10):

In an example of a preferred embodiment of the present invention, Auto print mode is an abbreviated form of the Print Composition mode. Before invoking the Auto Print command, the operator must first load a patient's image data from the local database. The operator can change the settings prior to printing by selecting PCW defaults on the PCW pull-down menu. A target printer must be selected via the Select Printer command on the PCW pull-down menu. The Open Command on the File pull-down menu activates the Open dialog box so that the operator can specify the PDS patient images to display. After the PDS reads and displays the patient images, the operator can perform any PDS operation for image windows. These operations include window, level, flip, rotate, text insertion, and annotations. After adjusting the new PCW images to the operator's preference, he selects Auto Print on the PCW pulldown menu. The PCW Print Setup window opens to enable the operator to verify or change the page format. Depending on how the operator wants to organize the frames to print, the operator can select either Auto Load or Preload on the Print dialog.

Detailed Description Text (11):

In an example of a preferred embodiment of the present invention, Auto Load sends the topmost series of PDS images to the target printer. Preload moves PDS images into the Auto Print Worksheet for preview and editing or for proofing the format and appearance.

The operator selects Auto Print on the PCW pulldown menu to send the current PDS images to the target laser printer for printing in the order they are displayed. PCW applies the current page settings for composing the appearance of the images on film. After printing begins, printing may be terminated by pressing the ESC key. When the current page is finished, printing stops.

Detailed Description Text (12):

In an example of a preferred embodiment of the present invention, the operator may select Preload on the PCW Print Setup dialog to open the Auto Print Worksheet window. This selection fills the window with preferred images. The Drag tool may be used to drag images into the window or the Auto Load option can be used to load images. A pointer device may be used to click on a PDS image to place that image into the first empty frame in the worksheet. The operator may print the worksheet by selecting Print on the File pulldown menu.

Detailed Description Text (14):

In an example of a preferred embodiment of the present invention, before invoking the New PCW command, the operator preferably loads a patient's image data from the local database and preferably has a target printer selected. The operator can do this with the Open command on the File pulldown. It activates the Open dialog box wherein the operator can specify the patient images to display. If no target printer is selected, the operator uses Select Printer on the PCW pulldown menu. The operator can change the settings for new PCW windows on the PCW pulldown.

Detailed Description Text (15):

In an example of a preferred embodiment of the present invention, the operator selects New PCW on the PCW pulldown to open a new Print Composition Window. This is the window which represents the final film page printed by the target printer. This PCW window originally opens with a frame grid. The grid layout of rows and columns is based on page settings that the operator made via the PCW Defaults on the PCW pulldown menu. This grid represents the individual frames that will contain the various components (images, overlays) for the new composition. The operator places all images and composed graphics in this window exactly how the operator wants each individual frame to be printed on the film page. What the operator sees (displayed) is what he gets (printed). ("WYSIWYG")

Detailed Description Text (16):

Preferably, the operator can change the number of images per page through the Arrange pull-down menu. If the operator selects a new layout, a new grid is drawn on the Print Composition Window. Each frame is selectable by a pointer device click and represents a local drawing area when selected. To insert an image into a frame, the operator selects the Drag tool. The operator may either use a key-click combination to load the selected image into the first empty frame, or the operator may simply drag the image to a desired frame and releases it. The image is then transferred into the frame and the PDS window is closed. To put an image back into a PDS window, the operator drags the image outside of the PCW window and releases it. A PDS window opens and the image is restored. Images may also be automatically inserted using Auto Load Images on the PCW pulldown. Auto Load fills all the PCW frames with PDS images.

Detailed Description Text (17):

In an example of a preferred embodiment of the present invention, the operator can perform any drawing operation (lines, circles) by selecting the appropriate tool from either of the PDS palettes and using the pointer device. The drawing area is clipped to fit within the selected frame so it cannot draw into adjacent frames. The operator can perform all allowed PDS image operations in the PCW as well by selecting the desired tool from either palette and then selecting a frame to work in.

Detailed Description Text (18):

In an example of a preferred embodiment of the present invention, when the PCW window composition is complete, the operator can perform any of the following functions: select Print on the File pulldown to print the active PCW window; select Auto Print as described previously; or select Close on the File pulldown to close the active window.

Detailed Description Text (20):

Many modern hospitals or treatment centers are geographically distributed and need to use all available types of communication networks. Many centers need to receive images from diverse and multiple modalities and transmit these images to multiple printer and storage devices. The industry has cooperated to produce a set of standard protocols. The preferred embodiment, PCW uses the American College of Radiology--National

Electrical Manufacturers Association (ACR-NEMA) Digital Imaging and Communication Standard. This standard comprises a standard hardware interface, a minimum set of software commands, and a consistent set of protocols for communication. PCW hides the details of image formatting protocols and printer set up protocols from the operator, yet allows customizing for both recurring jobs or emergencies.

Detailed Description Text (21):

Turning now to FIG. 2, a illustrative example of a preferred embodiment of the present invention is shown with a menu bar and pull-down selection lists. In an example of a preferred embodiment, a graphic user interface provides a simple means that a workstation operator can use to compose imagery data by selecting images, and annotating the imagery with text or graphic overlays. After composition, the operator may submit the new composition in the ACR-NEMA format for hard copy printing.

Detailed Description Text (24):

To facilitate choosing printing preferences, an illustrative example of a preferred embodiment, provides two modes of operation, auto print and print composition. The Auto Print mode can be used when the operator wants to print all of previously retrieved PDS imagery as they were stored in memory. When the operator wants to edit, annotate or otherwise alter the retrieved PDS images, the Print Composition mode can be chosen.

Detailed Description Text (25):

In a preferred embodiment, the Auto Print mode performs automatic printing of PDS imagery which is currently displayed at the work station. The images are printed in the order they were stored, retrieved, or displayed in the PDS window and at their current display settings (e.g. window & level). In a preferred embodiment, the workstation operator may choose to print all the displayed images sequentially or preload a new film page with a desired selection of images.

Detailed Description Text (27):

In a preferred embodiment, the graphic user interface provides a dialog box, implemented in PDS, which steps through a patient hierarchy (patient-study-series-acquisition-images) to select patient image data. Dialog boxes are used to query the operator for input. The graphic user interface in a preferred embodiment allows selection of a target camera to produce a hard copy. The selection is based on available on-site cameras which also defines certain formatting information (film size, frame layouts available) that will be available to the composition.

Detailed Description Text (29):

In a preferred embodiment, the print composition window is divided into frames. To initiate imagery composition for hard copy, the operator selects imagery displayed at the workstation and inserts or drags the selected image into a frame. The dragging tool in the Tool palette provides the means for dragging a PDS image into a print composition window frame. A preferred embodiment of the present invention allows the work station operator to drag or insert any displayed image into a frame, remove imagery from a frame, or transfer the image to another frame. Auto loading facilitates automatic insertion of images into a print composition frame. The auto loading format or layout is prescribed by parameters set up by the Arrange function.

Detailed Description Text (34):

In an example of a preferred embodiment, the present invention minimizes pointer device movement in order to limit travel about the display screens and make commands easier and quicker for the operator. The present invention provides for frame selection via the keyboard or pointer device. The operator can use the TAB and ARROW keys as illustrated in FIG. 3 to move the point of focus into a particular frame within a PCW window or work space of the present invention.

Detailed Description Text (36):

In an example of a preferred embodiment of the present invention, the operator can write text information into the present PCW frames. When the text input mode is activated, any of the alphabetic, numeric, or special keys on the keyboard can be used to write in a selected frame. Text input is activated by an icon available in the drawing palette. In a preferred embodiment the present invention provides access to the PDS soft key pad. The soft key pad is a PDS feature that provides for high level command execution through simulated keys on the display. The buttons generally equate to existing pull-down menu commands but they are provided in the key pad interface for quicker and easier access to frequently used commands. For example pushing the Auto Fill button fills a PCW window with PDS images and pushing the Auto Print button prints all currently displayed PDS images.

Detailed Description Text (39):

In an example of a preferred embodiment of the present invention, the Open command activates the Open dialog box. The Close command closes the current PCW window. The Save command saves modifications to the selected image in the PCW window and keeps the current PCW window active. The Print command activates the Print dialog to prompt the non-programmer operator to select printing of the current PCW document. The non-programmer operator has the opportunity to make changes to some of the printing parameters as well as the printer itself. The selected document is then sent off to be printed according to the page setup parameters. The Undo or reversal command allows the operator to reverse previous actions, such as editing and notation, taken at the workstation. There is no Undo command (unless your using this term abstractly).

Detailed Description Text (40):

In an example of a preferred embodiment of the present invention, arrange activates the Arrange palette. FIGS. 4A-4C illustrates a preferred embodiment of the present invention composition frames available on the Arrange pull-down menu. The operator can change the number and arrangement of frames for the currently selected the PCW window. The operator can also change the number and arrangement of frames that appear when a PCW window is opened by selecting PCW Defaults. This choice activates the PCW Defaults dialog that prompts the operator to change the number or layout of image frames. The number of images is determined by the capacity of the selected printing device. The format may also be changed after images are inserted into the PCW window.

Detailed Description Text (42):

In an example of a preferred embodiment of the present invention, new PCW creates a new PCW window with the current page settings. PCW allows for multiple windows to be displayed concurrently. PCW Defaults activates a dialog box where the operator sets new parameter values for new PCW documents and auto printing. These default parameter values are saved permanently and are restored each time the program is restarted. Frame Setup defines specific parameters for individual frames within the current PCW window. The selections can be applied to all frames within the window. View Frame displays a single frame in a single, usually larger window, so that the non-programmer operator may examine a frame in finer detail.

Detailed Description Text (44):

In an example of a preferred embodiment of the present invention, Auto Print sends all of the currently displayed PDS images to the printer as specified by the current settings. The operator may change the print settings via the PCW Defaults option in the PCW pull-down menu. The choice is made to "Auto Load" the displayed images to the printer or to "PreLoad". Select Printer allows the non-programmer operator to select the destination printer. The print function acquires a new set of parameters (i.e. available formats, film sizes) specific to that printer.

Detailed Description Text (50):

Referring now to FIG. 5, a diagram of the hardware environment, for an example of a preferred of the present invention, is depicted. It is useful to describe the hardware, thereby placing the present invention in its operational environment. FIG. 5 is a block diagram of a video image display system incorporating a hardware environment in which one example of a preferred embodiment of the present invention may reside. In the preferred embodiment this hardware environment is typically a Personal Display System (PDS) manufactured by Vortech Data, Incorporated of Richardson, Tex.

Detailed Description Text (53):

In one example of a preferred embodiment of the present invention, PCW, the system bus is the NuBus. A high-performance Ethernet controller provides basic connectivity to a medical information network. In an example of a preferred embodiment, the present invention uses a Dome Macintosh imaging display board for each dedicated display in the PDS. It is a 10 Mhz 32-bit Texas Instruments TMS 34020-based specialized image processor. The preferred embodiment supports up to six high-resolution displays. In a preferred embodiment of the PCW, image presentation features include display of diagnostic images inside windows with normal, industry standard operations and image organization as it pertains to the appearance and functions available in each window.

Detailed Description Text (62):

Dialog boxes are used in window oriented interactive applications to elicit additional information from the workstation operator whenever some operator action is requested. FIGS. 9A-9F shows, for example, how the PCW Printer Selection dialog box is opened in a preferred embodiment by activating the Select Printer option on the PCW pulldown menu.

The illustrated dialog box comprises a rifle, control buttons, a list box, and an indication of the logical name of the selected printer. If the current printer is the target printer, the user can select OK or Cancel. To choose another available, connected printer named in the list box, the user can use the pointer to highlight the name and click on OK. On-line help is available by clicking on Help. After the user finishes supplying additional information or changing control settings, at least one control switch or push button is provided to accept the new condition or to dismiss the dialog box without taking any action.

Detailed Description Text (63):

In an example of a preferred embodiment of the present invention, a central design concept of the present invention is to allow manipulation of graphic objects such as composition frames, medical images, and composed PCW documents directly on the video display screen at the workstation. A pointer enables the operator to point to an object, select the object by clicking a control button on the pointer, move objects between windows, or choose an action to apply to some selected object. The operator has complete control of any task in processing medical images.

Detailed Description Text (64):

Preferably, pointing allows the user to indicate what element on screen is currently relevant to their task, such as grasping a film page, arranging it for comparison with others, discarding, stacking, annotating. While pointing at an object, the user can select the object for action. Until an object is selected, pointing is like flipping, thumbing, or scanning real objects.

Detailed Description Text (66):

Preferably, the frames of a PCW window are represented by an array of frame records. Each of the frame records contains information that describes the frame's position within the window as well as the information that is contained within it (such as image data, lines, circles, curves, text, and overlays). In a preferred embodiment, this information is stored within the WindowData structure because PDS drawing and image operations apply to PCW frames as well.

Detailed Description Text (67):

In an example of a preferred embodiment of the present invention, when drawing graphics on an image in the PCW window, the operator must first select and activate a PCW frame by clicking on a frame with the mouse. This action sets a selected flag within the frame's structure. Drawing is performed in an off screen grafport to prevent flickering and then blitted or transferred back into the frame. This offscreen grafport is a frame's annotation layer. This is the annotation bit map associated with the image when sent to a printer and/or storage. The clipping area for the PCW window is defined by the selected drawing frame's boundaries. Clipping prevents image display from running over into adjacent frames and keeps all drawing within a selected frame.

Detailed Description Text (70):

In an example of a preferred embodiment of the present invention, overlay information is represented as a bit map separate from the actual medical image data. The overlay bit map is derived from the annotation information created using the PDS drawing tools. During the PCW composition, the two bit maps (image, annotation) are brought together and displayed in the selected frame. FIG. 13 shows how the two bit maps exist separately and are combined in the display. Printing and/or storing the PCW document requires supplying pointers to the overlay information bit map and image data bit map or the bit maps themselves.

Detailed Description Text (74):

In an example of a preferred embodiment of the present invention, scout lines indicate the intersection of a displayed image with another image. Scout lines and patient orientation values are displayed by means of existing PDS routines. The image data and rectangular drawing area within the frame are the only parameters needed by the display routines to correctly display the scouts and orientation in a PCW frame. The selection of scouts to be displayed is provided on the scouts. Image orientation values are displayed if they are provided in the image header.

Detailed Description Text (79):

FIG. 18 shows a sample template with labels such as: Study Date, Patient Name, and Patient ID. A set of such templates may be predefined according to user preference. Then, at composition time, the user can select an appropriate template for the current medical image.

Detailed Description Text (94):

Patient demographic information coexists with each image in the medical image database and often it is desired, or sometimes required, to be printed along with the medical image. Text templates can be customized for an installation site, according to the user's preference. When a medical image is retrieved, the values of the variables are transferred into the user selected text template layout. The text templates are defined in the configuration file to display the kinds of pertinent patient or modality information in a way that will provide the best diagnostic presentation, in the current medical situation.

Detailed Description Text (97):

For example, consider printing a document consisting of a PCW window that contains composed frames. Each frame contains a medical image with an overlay and a text template. The frame record contains a pointer to the image record which contains all the information associated with a patient's medical image, including the actual image data, window & level values, overlays, annotations, and scouts.

Detailed Description Text (123):

A detailed source code listing for these modules is contained in the Software Microfiche Appendix. The operations carried out by the source code of preferred embodiment, PCW, are self-explanatory to a person of ordinary skill in the art with a working knowledge of the C programming language and the Macintosh operating systems, its ability to use windows and frames, and to add layers of functions. Also, the Macintosh operating system's ability to receive operator input from mouse and keyboard, and to display output on the video display screen is well known by those skilled in the art. Consequently, a detailed description of each and every one of these functions in the preferred embodiment is not necessary to understand the present invention. However to emphasize some of the non-obvious features of the present invention, the ARRANGE, PULL-DOWN MENUS, PRINT, COMMUNICATIONS, FRAMES, and WINDOWS modules are described. The descriptions are presented in the alphabetical order of the module names.

Detailed Description Text (143):

The PCW.sub.-- SelectFrame function checks the frames to see if the coordinates of the mouse pointer, <pt>, are within its boundaries. This takes care of highlighting selected frames and selection of multiple frames when the user clicks on a frame. It then sets selected frames to selected or not selected

Detailed Description Text (177):

The PCW.sub.-- DoPCWmenu function is called when PDS detects actuation of the PCW pull-down menu items, or when the softkeys are actuated. Depending on which item the operator selects, the corresponding process represented by that item is carried out.

Detailed Description Text (229):

In describing the invention, reference has been made to a preferred embodiment. However, those skilled in the art and familiar with the disclosure of the invention may recognize additions, deletions, substitutions, or other modifications which would fall within the scope of the inventions defined in the claims. For example: in an alternative example of a preferred embodiment, the present invention is designed to provide free formatting of images. Images may be placed arbitrarily into the PCW window and scaled to different sizes. A graphical interface allows the operator to arrange images and text more suitable to individualized or special needs.

Detailed Description Text (233):

In another example of a preferred embodiment, the present invention provides the capability to save PCW compositions in an archive device and then recall them later. The method of retrieving stored images will be similar to the way PDS currently opens images via the Open dialog. Now, PCW only composes images and prints them locally, but the composition cannot be saved for future reference. PCW provides the means for the non-programmer operator to select an existing PCW composition document residing in archive storage and have it sent directly to the laser camera for printing.

Detailed Description Text (234):

In another example of a preferred embodiment, the present invention provides the capability to allow the non-programmer operator to layout and define how patient demographic information is presented in free-form on the film. In another example of a preferred embodiment, the present invention provides the capability to select and save page defaults for specific modalities. Provide the user with a set of routines to Autoprint PDS images. This option allows the user to choose a print routine that best suits the needs of schedules (speed) or of materials (images per page). In another



example of a preferred embodiment, the present invention provides the capability to display, generate, and print multiple overlays for any image. In another example of a preferred embodiment, the present invention provides the capability to include PCW folders that will contain PCW documents or other folders.

# Detailed Description Paragraph Table (101):

GLOSSED

## WORD DEFINITIONS

activate In PCW, to make a program command available for use by means of an appropriate point and pick operation. Such operations are interpreted by the event handlers and carried out by the application modules. active window The frontmost window on the desktop; the window where the next action will take place. The active window's title bar is highlighted. alert A warning or report of an error in the form of an alert box or computer beep, or both. alert box A dialog box that is displayed on the workstation screen to give a warning or to report an error during the use of an application program. annotate See image composition. attribute A characteristic or property; for example, the kind of modality that captured a medical image, or a patient's name. See parameter, and value. bit image A collection of bits in memory that has a 2- or 3-dimensional matrix representation. These representations are typically displayed as visible images on the workstation screen. bit map A set of bits that represents the position and state of corresponding items. See pixel. bit-mapped graphic A method of representing digital computer images in which each pixel on a display corresponds to a bit (or set of bits) in memory, to allow each pixel to be controlled. choose (or select) Pointing and clicking or using a keyboard equivalent to make a choice, such as selecting a command from a menu or activating a soft key. click Move the mouse as to position the pointer on something, then press and release the mouse button without moving the mouse. (See double click.) clipboard The holding place for what you last cut or copied. close To remove a window from the desktop. close box The small white box on the left side of a title bar. Clicking this box closes an active window. command A word or phrase, usually in a menu, describing an action for the computer to perform. compose See image composition. composition frame One of the set of row-column layouts that can be selected for the composition of new medical images. The operator can choose layouts from a set provided in the Arrange palette. composition window A PCW window, titled Print Composition or AutoPrint Worksheet. The operator uses these windows to choose the frame layout for the composition of new medical images. configuration file A data file used by application software to provide information about the kind of peripheral devices and the physical/ mechanical properties. It describes the devices, optional features, system or communication parameters, and other programs installed. consistent format One of the concepts of design guidelines for graphics user interfaces. This concept provides that each appearance of similar objects resemble each other. critical care area One of the areas or departments in a hospital. Patients there are in life threatening condition. customize In user-oriented programming, allowing the operator to define user or situation preferences for values of operating parameter or to use preset default values. data entry/ retrieval The actions of a workstation operator to submit/ receive information. dedicated device Typically in proprietary configurations, a dedicated device is hardwired to its controller. Otherwise, a dedicated device may be one such as a printer that is used only for x-ray film prints. default value A predetermined attribute, option, or value that is assumed when no other is explicitly specified. desktop The Macintosh working environment - the menu bar, any window or dialog box, and the remaining gray area on the screen. dialog box A kind of window containing a message that instructs or that can request more information from you. The message can be a warning that you're asking your computer to do something it cannot do or that you're about to destroy some information. A dialog box can require the operator to furnish a response before continuing; or may permit the operator to access and use other windows before disposing of the dialog box. In some cases a beep accompanies the opening of a dialog box. dimmed command A command that appears half-lighted compared to other commands in the menu. You cannot click such a disabled command. A commands is disabled while the action it represents is temporarily inappropriate. dimmed icon An icon that represents a disk that has been ejected, or a document, folder, or application on a disk that has been ejected. Dimmed disk or folder icons can be selected and opened, but the documents and applications on them can't be opened. direct manipulation The action of using a mouse or pointing device to move graphical representations around on the workstation display screen. disk The magnetic medium that the computer uses for storing information. double-click Position the pointer where you want an action to takeplace. Then press and release the mouse button twice in quick succession without moving the mouse. (See click.) dragging Moving an object around the screen as if it were attached to the pointer. Performed by holding the select mouse button and moving the pointer. When you release the mouse button, you either confirm a

selection or move an object to a new location. drawing palette One kind of pull-down menu. In PCW, the palette that contains the tool icons used for entering text or drawing on the composition frames. editing See image composition. editing session The period while the operator is composing new images in the Print Composition or AutoPrint Worksheet windows. entering text In PCW, the operator can make textual annotation on medical images in the composition frame by using the drawing palette and the text entry tool. feedback People expect physical actions at a workstation to have physical results. For example, when a drawing tool moves, an operator expects to see a line drawn. Physical results are quickly displayed to provide this assurance. file A collection of related data stored and retrieved by an assigned name. folder Holds documents, applications, or other folders on the desktop. Folders allow you to organize information in any way you want. format A specific arrangement of a set of data. See protocol. font A collection of letters, numbers, punctuation marks, and other typographical symbols with a consistent appearance. frontmost The active or selected image (or window) on the desktop. grafPort The data type for a graphics port, or the shorthand for the graphics port. graphics user interface In modern computer environments, the use of a fairly high resolution video monitor and bit-mapped graphics to give a WYS/WYG appearance to the objects and images represented on the display screen. grow box A box on the bottom-right corner of some active windows that lets you resize the window. hard disk A disk drive that is permanently encased. In PCW, the site of local database storage. highlight To make something visually distinct from its background, usually to show that it has been selected or chosen. I-beam A type of pointer used in entering and editing text. icon A graphic representation of an object, a concept, or a message. industry standard The medical computing industry has adopted the ACR-NEMA communication format communication standard. In PCW, this standard is followed in formatting messages to include all portions of information that make up the PCW document. image (actions) Images can be captured (acquired from the source modality), stored (locally, or remotely) (temporarily for a short time or archived for a long time), retrieved from local or remote storage, viewed, previewed, adjusted, manipulated, and composed. image composition In PCW, the operator has various tools to accomplish several tasks in composing new images or editing previously composed images. These tasks are: adjusting the image characteristics, adding templates or scout lines, annotating by entering text or drawing on the images, editing images by inserting, changing, or deleting information, and arranging the layout when printing multiple images on one single film page. image palette One kind of pull-down menu. In PCW, the palette that contains the tool icons used for adjusting the image properties in the composition frames. invisible window One attempt to reduce the amount of information visible on a

#### Detailed Description Paragraph Table (102):

workstation screen provided means that information and commands are hidden from the operator's view until "hot spots" redetermined points of activation) are selected. laser film printer In medical applications, film-page printers with a laser beam as the exposure means. mask A bit pattern used to filter, screen, or set/reset desired bits. medical diagnostic image In medical applications, images captured on film pages. The source of typical medical images is one or more of the radiographic, sonic, or nuclear imaging modalities. menu A list of commands that appears when you press and hold the mouse button while pointing to a menu title in the menu bar. As you continue to hold the mouse button and move the pointer through the list, each command is highlighted as the pointer moves over the commands. You select the highlighted command when you release the mouse button. menu title A word or phrase in the menu bar designating one pull-down menu. menu bar In PCW, the horizontal strip at the top of the PDS window that contains the action items currently available to the operator. modality Generic term for the various kinds of medical image producing devices; for example x-ray, CAT scan, magnetic resonance, gamma cameras, or ultra-sound. mouse A kind of pointer device you move on a flat surface. As you move the mouse, the pointer on the screen moves a proportionate distance in the same direction. mouse button A control button on the mouse. See click, double click, drag, highlight, choose, select, activate. open To create a window so you can view a list or medical images. operating system The Macintosh software program that organizes the actions of parts of the computer and its peripheral devices. It handles low level tasks such as memory management, port control, and disk input and output. optical storage device A kind of mass data storage device in which the recording medium is optical laser platters. option A selectable action item on a menu. (PACS) picture archival and In medical applications, a computer based system that permits the communication system user to capture, store, retrieve, manipulate, archive, and transmit medical diagnostic images. With PCW the user can also compose new images, based on previously captured images and translate the images into the ACR-NEMA communication format. parameter The information supplied by a program or user to an application program, usually in menu commands, dialog boxes, or preset defaults. Some

applications use configuration files to store parameters for "data forms," or information about peripheral devices. See attribute, value. patient list (queue) A queue of selected patient images used for viewing next or previous patient or image. pixel From the words "picture element." Pixels exist at all times, only their color changes. A pixel is the area on screen that is lighted by one bit of data. point and pick The concept of point and pick describes the actions of using pointer devices (such as a mouse, trackball, touch-screen, or stylus) to select objects or commands. See click, double click, drag, highlight, choose, select, activate. pointer A small shape on the screen, most often an arrow pointing up and to the left, that follows the movement of the mouse. See I-beam. pointer device A computer input device such as a mouse, trackball, touch-screen, or stylus. Workstation operators use these devices for point and pick actions as well as drawing. preferences Alternate or favorite combinations of control settings useful in particular situations. The preferred settings can be saved in preference sets, and deleted when no longer useful. print routines In PCW, the software modules that build the various message formats for sending images to storage or printers. See industry standard communications format. printer device See laser film printer. protocols In network communications, various sets of standard rules that govern the operation of functional units of a communications system that must be followed if communication is to take place. See industry standard communications format. scout lines In PCW, lines that indicate the various "elevations" where other images (like slices) were made. scroll To move an area or a list in its window so that you can see a different part. scroll arrow An arrow on either end of the scroll bar. Clicking a scroll arrow moves the area or the list one increment. Clicking and holding a scroll arrow scrolls the area or the list continuously, until the button is released. scroll bar A rectangular box that may be along the right or the bottom of a window. Moving the scroll bar causes the view in the window to change. scroll thumb The white box in a scroll bar. The position of the scroll thumb in the scroll bar indicates the position of what is visible in the window relative to the total area or the entire list. select (choose) To designate where the next action will take place. To select, you click or drag across information. selection The information affected by the next command. The selection is usually highlighted. The insertion point is also a selection. Soft Keypad A series of keys, represented as button icons, that are used for selecting PDS functions. In PCW, AutoFill and AutoPrint software Programs, or instructions for the computer to carry out. storage device In PCW, magnetic or optical media used as either local, or remote database. text In PCW, character data that can be superimposed on medical images. text template In PCW, information that resembles the text variable names on a, data form, but also contains formatting that presents the actual values of the variables. title bar The horizontal bar at the top of a window. Plain text names the contents of the window. You can use the title bar to move the window on the desktop. This bar is highlighted if the window is active. See close box, zoom box. value A specific occurrence of an attribute; for example, "Sam" for a patient name. A value is the quantity assigned to constants, parameters, variables, or symbols. window An area displaying information on the desktop. More than one window may be open. You view lists and medical images through a window. You can open or close it, move it on the desktop, sometimes change its size, edit its contents, and scroll through its lists and images. window and level Shorthand term for image window width and range of brightness and contrast. workstation In PCW, the PDS computer, monitor, keyboard, pointer device, and optional PCW software. It can be configured on a network with other Vortech systems, such as the IARS (Image Archive and Retrieval System) or MIG (Medical Image Gateway). It can be configured to work with other vendor's systems, such as Eastman Kodak's IMAGELINK. WYSIWYG composition In the word processing world, What You See Is What You Get, referring to the ability of the system to faithfully display on a screen and reproduce on a printer the same image. This processing concept assures that the operator is in control of the content and format (spatial layout and font choice) of the document. This also means that the computer quickly and directly displays the result of the operator's choices. zoom box The small box on the right side of the title bar of some windows. Clicking the zoom box expands a window to its maximum size Clicking again returns the window to its opening size.

#### CLAIMS:

1. A method for composing medical diagnostic imagery comprising the steps of:  
transmitting a medical diagnostic image from a first type modality to a workstation;  
transmitting a medical diagnostic image from a second type modality to a workstation;  
loading the medical diagnostic image from the first type modality into a second frame

of a window;

loading the medical diagnostic image from the second modality into a frame a first frame of a window;

presenting the first and second medical diagnostic images together concurrently on a single display;

displaying a set of graphic user interface commands at said workstation to enable an operator to manipulate the medical diagnostic images;

accepting said graphic user interface commands upon selection of a command by an operator at said workstation;

converting said operator selected graphic user interface commands into a set of commands over a network for printing, display or storage of said edited imagery;

presenting a text template upon the graphic user interface;

presenting a text padding area surrounding the display of a medical diagnostic image within a frame;

accepting user text input;

placing said user text input into said text padding area;

displaying said user text input in said text padding area;

presenting a set of text editing commands for editing the contents, size and font, and location of said text within said text padding area;

storing the text template as a text object associated with the medical diagnostic image which the text padding area surrounds;

reading a set of default values; and

generating a medical diagnostic imagery transfer command wherein command parameter values are set equal to the default values.



US005734915A

**United States Patent** [19]

Roewer

[11] Patent Number: **5,734,915**[45] Date of Patent: **Mar. 31, 1998**[54] **METHOD AND APPARATUS FOR  
COMPOSING DIGITAL MEDICAL IMAGERY**[75] Inventor: **Paul H. Roewer**, Garland, Tex.[73] Assignee: **Eastman Kodak Company**, Rochester,  
N.Y.[21] Appl. No.: **332,574**[22] Filed: **Oct. 31, 1994****Related U.S. Application Data**

[63] Continuation of Ser. No. 982,388, Nov. 25, 1992, abandoned.

[51] Int. Cl.<sup>6</sup> ..... **G06F 3/00**[52] U.S. Cl. .... **395/773; 395/340; 364/922**[58] Field of Search ..... **395/326-358,  
395/804, 924, 200.01, 200.09, 773; 128/920,  
922; 364/224.5, 224.6, 922, 922.2, 922.3**[56] **References Cited****U.S. PATENT DOCUMENTS**

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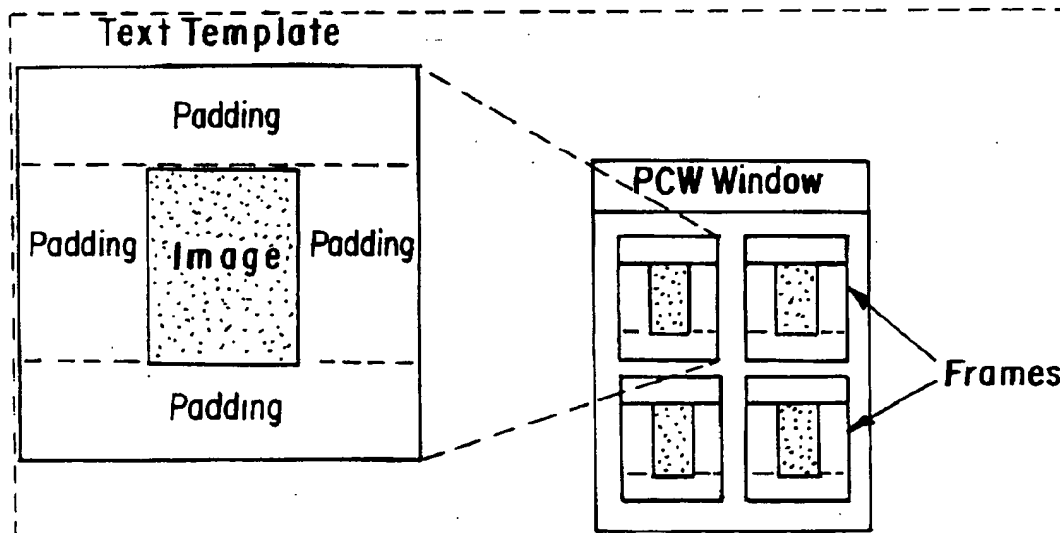
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*Primary Examiner*—John E. Breene*Attorney, Agent, or Firm*—William F. Noval; G. Michael  
Roebuck

[57]

**ABSTRACT**

A process for translating a set of point and click operations in a window oriented environment into a set of ACR-NEMA commands for formatting film pages of medical images. In particular, the software modules that comprise the invention relate to processes for interfacing a non-programmer user with a digital computer to produce a desired group of medical images, selected from stored images. The new group of images can be edited, annotated, and arranged by the user. The process then converts the image data into an industry standard format which can be transmitted to printers or storage on a network. A process for automatically generating a set of ACR-NEMA commands for formatting film pages of medical images, based upon the intrinsic characteristics of the images, defined as a set of ACR-NEMA elements.

**2 Claims, 25 Drawing Sheets**Microfiche Appendix Included  
(7 Microfiche, 648 Pages)



US005542003A

# United States Patent [19]

Wofford

[11] Patent Number: **5,542,003**  
 [45] Date of Patent: **Jul. 30, 1996**

[54] **METHOD FOR MAXIMIZING FIDELITY AND DYNAMIC RANGE FOR A REGION OF INTEREST WITHIN DIGITIZED MEDICAL IMAGE DISPLAY**

[75] Inventor: **Mark G. Wofford**, Dallas, Tex.

[73] Assignee: **Eastman Kodak**, Rochester, N. Y.

[21] Appl. No.: **120,600**

[22] Filed: **Sep. 13, 1993**

[51] Int. Cl.<sup>6</sup> ..... **G06F 159/00**

[52] U.S. Cl. .... **382/132; 382/298; 395/139**

[58] Field of Search ..... **364/413.13, 413.22; 382/6, 132, 298, 299; 128/653.1; 395/101, 102, 139**

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Primary Examiner—Gail O. Hayes

Assistant Examiner—Joseph Thomas

Attorney, Agent, or Firm—Michael Roebuck

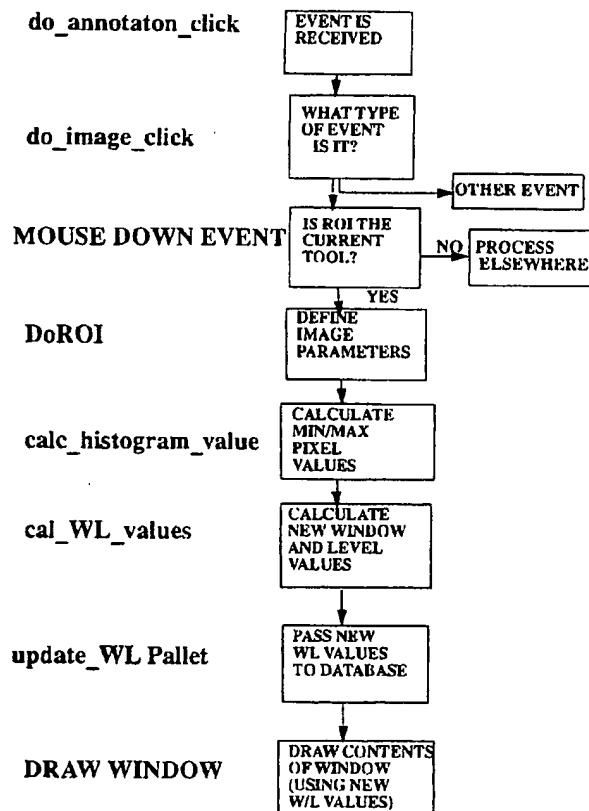
[57]

## ABSTRACT

A method and apparatus is presented in which a medical imagery workstation provides an end-user interface which when activated, windows and levels a whole image or a region of interest within the image utilizing the pixel values within a selection area. The method and apparatus customizes the pixel values when the entire image is selected before calculating the window and levels to produce a higher contrast, then redraws the entire image utilizing the newly calculated window and level values. The present invention provides a method and apparatus to enable an operator to define a region of interest, that when activated, the image is redrawn utilizing only the pixel values from the region of interest, maximizing the brightness and contrast of the selected.

**8 Claims, 14 Drawing Sheets**

Microfiche Appendix Included  
 (2 Microfiche, 69 Pages)





US006388687B1

(12) **United States Patent**  
**Brackett et al.**

(10) **Patent No.: US 6,388,687 B1**  
(45) **Date of Patent: May 14, 2002**

(54) **OPERATOR-INTERACTIVE DISPLAY MENU  
SHOWING STATUS OF IMAGE TRANSFER  
TO REMOTELY LOCATED DEVICES**

(75) Inventors: **Charles C. Brackett**, Waukesha;  
**Gregory C. Stratton**, Wauwatosa;  
**James S. Lehoullier**, Waukesha;  
**Takao Shibashi**, Brookfield, all of WI  
(US)

(73) Assignee: **General Electric Company**, Waukesha,  
WI (US)

(\*) Notice: Subject to any disclaimer, the term of this  
patent is extended or adjusted under 35  
U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/300,967**

(22) Filed: **Apr. 28, 1999**

(51) Int. Cl.<sup>7</sup> ..... **G06F 3/00**

(52) U.S. Cl. .... **345/810; 345/478; 345/840;**  
709/201

(58) Field of Search ..... **345/771, 748,**  
**345/773, 810, 840; 709/201; 358/1.15,**  
**401, 403**

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*Primary Examiner*—Raymond J. Bayerl

*Assistant Examiner*—Kieu D. Vu

(74) *Attorney, Agent, or Firm*—Ostrager Chong & Flaherty  
LLP

(57) **ABSTRACT**

A computerized imager is programmed with software that allows properly formatted image frames (objects) to be sent to one or more remotely located devices selected from a list of configured devices. For each job selected for transfer to a remote device, an element is added to a linked list which forms a virtual queue, each element incorporating a respective pointer (i.e., the file name) identifying each stored image to be included in that particular job. Each element identifies the image frames included in the job and the destination remote device for that job. An interactive display menu enables the operator to easily redirect queued jobs from one destination remote device to another.

**24 Claims, 8 Drawing Sheets**

DICOM STATUS					
NETWORK STATUS: CONNECTED					
DEVICE	ACTIVE QUEUE	PARTIAL PRINT	HOLDING QUEUE	STATUS	INFO
PRINTER A	2 <sup>68</sup>	3 OF 15 <sup>70</sup>	1 <sup>72</sup>		
PRINTER B	0	0 OF 8	0		
STORAGE A	0 <sup>74</sup>		0 <sup>76</sup>		

DISPLAY QUEUE	VERIFY	SEND <sup>75</sup>
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SET TO SELECT



US006117079A

**United States Patent** [19][11] **Patent Number:** **6,117,079****Brackett et al.**[45] **Date of Patent:** **Sep. 12, 2000**

[54] **METHOD AND APPARATUS FOR HANDLING IMAGE DATA AFTER UNSUCCESSFUL TRANSFER TO REMOTELY LOCATED DEVICE**

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[75] **Inventors:** Charles C. Brackett, Waukesha;  
 Gregory C. Stratton, Wauwatosa;  
 James S. Lehouillier, Waukesha, all of  
 Wis.

*Primary Examiner*—Maria Lateef  
*Assistant Examiner*—Maulin Patel  
*Attorney, Agent, or Firm*—Dennis M. Flaherty; Christian G.  
 Cabou; Phyllis Y. Price

[73] **Assignee:** General Electric Company,  
 Milwaukee, Wis.

[57] **ABSTRACT**

A computerized imager is programmed with software that allows properly formatted image frames (objects) to be sent to one or more remotely located devices selected from a list of configured devices. For each job selected for transfer to a remote device, an element is added to a linked list which forms a virtual queue, each element incorporating a respective pointer (i.e., the file name) identifying each stored image to be included in that particular job. Each element identifies the image frames included in the job and the destination remote device for that job. Elements for failed jobs are transferred to a Holding Queue. An interactive display menu enables the operator to easily redirect the failed jobs to a secondary remote device by clicking on the menu.

[21] **Appl. No.:** 09/300,998

[22] **Filed:** Apr. 28, 1999

[51] **Int. Cl.<sup>7</sup>** ..... A61B 8/00

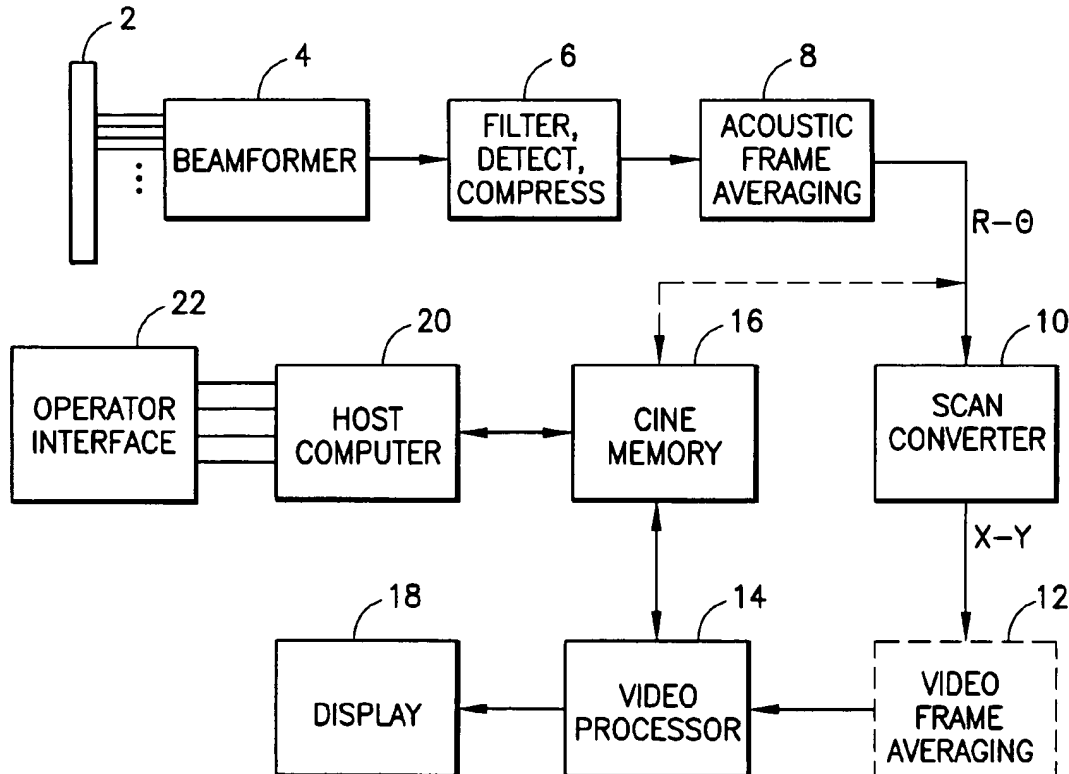
[52] **U.S. Cl.** ..... 600/437; 607/443

[58] **Field of Search** ..... 600/437, 438,  
 600/443, 444, 447, 455; 128/916

[56] **References Cited****U.S. PATENT DOCUMENTS**

5,897,498 4/1999 Canfield et al. .... 600/437

**33 Claims, 8 Drawing Sheets**





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(5276797 OR 5517316 OR 5625757 OR 5897498).PN.	9

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US Pre-Grant Publication Full-Text Database  
JPO Abstracts Database  
EPO Abstracts Database  
Derwent World Patents Index  
IBM Technical Disclosure Bulletins

**Search:**

L9

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**Set Name Query**  
side by side

**Hit Count Set Name**  
result set

*DB=USPT,PGPB,JPAB,EPAB,DWPI,TDBD; PLUR=YES; OP=ADJ*

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<u>L8</u>	(6440071 or 6272470 or 6417870 or 6440072).pn.	5	<u>L8</u>
<u>L7</u>	(6260021 or 5668998 or 5586262 or 5581460 or 5924074).pn.	11	<u>L7</u>
<u>L6</u>	L5 and ((705/\$).ccls.)	6	<u>L6</u>
<u>L5</u>	L4 and (transfer\$6 or transmit\$6) same (data or fil\$3)	69	<u>L5</u>
<u>L4</u>	L2 and (program\$6 or software or operat\$3 adj system or driv\$3) same (control\$6 or adjust\$6)	102	<u>L4</u>
<u>L3</u>	L2 and network\$3 same (manag\$3 or execut\$6) same (transfer\$6 or transmit\$6) same (data or fil\$3)	9	<u>L3</u>
<u>L2</u>	L1 and (exam\$ or terminolog\$6 or list\$3) same (description or describ\$3)	149	<u>L2</u>
<u>L1</u>	(display\$3 or imag\$4) same (ultra-sound or ultrasound) same (medical or hospital) same (computer\$6 or network\$6 or LAN or local area network or WAN or wide area network)	440	<u>L1</u>

END OF SEARCH HISTORY

**WEST**

Generate Collection

Print

L3: Entry 6 of 9

File: USPT

Aug 7, 2001

DOCUMENT-IDENTIFIER: US 6272470 B1  
TITLE: Electronic clinical recording system

Detailed Description Text (5):

The diagnostic medical imaging modality 1 includes a diagnostic ultrasound system, endoscope system, diagnostic X-ray system, CT system, and MR system. The image server 2 is a computer system for managing information of medical images, and comprises a recording apparatus and a communication means enabling data transfer using the network as a medium. The recording apparatus may be a magneto-optical disk (MO) drive, hard disk drive (HDD), digital video disk (DVD) drive, or a portable disk (PD) drive. The electronic clinical recording system 3 starts operating with insertion of a patient card (health care, medical care, or welfare card) 6 serving as a clinical recording carried by a patient himself/herself.

Detailed Description Text (18):

FIGS. 3 and 4 each show the data structure to consultation records. The consultation record is composed of a plurality of plain text files containing texts written in SGML or HTML, and a group of data files containing various data items. The HTML supports a description facilitating reference of an external file. Not only characters but also a still image, motion picture, voice, chart, and list can therefore be handled at the same time. Using a WWW browser, multimedia information can be viewed in a style that is the same among various models of computers or OSs. A specified WWW browser makes it possible to download a program written in Java or Visual Basic or a program written in JavaScript typical of a scripting language to the WWW browser, and to then execute the program.

Detailed Description Text (32):

If the consultation is the second or subsequent consultation, the processing of steps 110 to 115 in FIG. 6 is executed sequentially. The electronic clinical recording system 3 carries out, as mentioned above, input mode selection and sets the addition mode (step 110). The details of mode selection are described in the above description of the flowchart of FIG. 8. The contents of a patient card are read and listed (steps 111 and 112). Thereafter, the consultation record of any previous consultation is displayed (step 113), and information of a present consultation is input (step 114). The updated consultation record is then written in the patient card and stored therein (step 115).

Detailed Description Text (44):

FIG. 10 outlines a method in which the FTP is used as a protocol for data exchange. The description will proceed on the assumption that a consultation record produced at hospital A is displayed using the electronic clinical recording system at hospital B. In a consultation record, link information indicating that examination-related images are stored in the image server at hospital A shall be described as follows:

Detailed Description Text (47):

FIG. 11 outlines a method in which the HTTP is used as a protocol for data exchange. The description will proceed on the assumption that a consultation record produced at hospital A is displayed using the electronic clinical recording system at hospital B. In the consultation record, link information indicating that examination-related images are stored in the image server at hospital A shall be described as follows:

Detailed Description Text (51):

FIG. 12 outlines a method in which a protocol for electronic mail is used as a protocol for data exchange. The description will proceed on the assumption that a consultation record produced at hospital A is displayed using the electronic clinical recording system at hospital B. In the consultation record, link information indicating that examination-related images are stored in the image server at hospital A shall be

described as follows:

**WEST**

Generate Collection

Print

L5: Entry 12 of 69

File: USPT

Aug 27, 2002

DOCUMENT-IDENTIFIER: US 6440072 B1

TITLE: Medical diagnostic ultrasound imaging system and method for transferring ultrasound examination data to a portable computing deviceAbstract Text (1):

The preferred embodiments described herein provide a medical diagnostic ultrasound imaging system and method for transferring ultrasound examination data to a portable computing device. In one preferred embodiment, ultrasound examination data is transferred from a medical diagnostic ultrasound imaging system to a portable computing device, such as a personal digital assistant. The ultrasound examination data can be viewed on the portable computing device or further transferred to a review station or another portable computing device for review. In some preferred embodiments, the examination data is converted from a form readable by the ultrasound system to a form readable by the portable computing device or review station. The ultrasound examination data can be transferred using a wired connection or using wireless technology, such as an infrared communications link. The preferred embodiments can also be used with other medical acquisition devices and medical examination data. Examination data can also be transferred from medical networks, such as a medical diagnostic ultrasound imaging network.

Brief Summary Text (2):

In many medical applications, it is often desired to view a medical image on a device other than the acquisition device that generated the image. For example, in some environments, an ultrasound imaging system is hard-wired to an image network, and computer review stations at remote locations can access and view images generated by the ultrasound system. In non-network environments and in other applications, images are transferred to viewing devices using "sneakernet" transfer: images generated by the ultrasound system are stored on portable storage media (such as a videotape or a magneto-optical ("MO") disk), and the portable storage media is physically carried from the ultrasound system to a viewing device (such as a television with a VCR or a computer review station).

Brief Summary Text (3):

There are several disadvantages associated with the sneakernet approach. First, this approach often makes inefficient use of the relatively large storage capacity of the portable storage media. For example, in many situations, an entire videotape is used to transfer a few seconds or minutes of image data. Further, videotapes are bulky and susceptible to stretching, overheating, and decay. Additionally, difficulties arise when the ultrasound system and the viewing device do not support the same type of portable storage media. For example, although many ultrasound systems use videotape to store images, computer review stations typically do not have a VCR to play the stored images. Also, this approach requires the user to be familiar with the operation of the ultrasound system (to transfer an image from the system to the portable storage media) as well as the operation of the viewing device (to transfer the image from the portable storage media to the viewing station).

Brief Summary Text (7):

By way of introduction, the preferred embodiments described below provide a medical diagnostic ultrasound imaging system and method for transferring ultrasound examination data to a portable computing device. In one preferred embodiment, ultrasound examination data is transferred from a medical diagnostic ultrasound imaging system to a portable computing device, such as a personal digital assistant. The ultrasound examination data can be viewed on the portable computing device or further transferred to a review station or another portable computing device for review. In some preferred embodiments, the examination data is converted from a form readable by the ultrasound system to a form readable by the portable computing device or review station. The

ultrasound examination data can be transferred using a wired connection or using wireless technology, such as an infrared communications link. The preferred embodiments can also be used with other medical acquisition devices and medical examination data. Examination data can also be transferred from medical networks, such as a medical diagnostic ultrasound imaging network.

Drawing Description Text (4):

FIG. 2 is a flow chart of a method of a preferred embodiment for transferring ultrasound examination data from a medical diagnostic ultrasound imaging system to a portable computing device.

Drawing Description Text (6):

FIG. 4 is an illustration of a portable computing device of a preferred embodiment displaying ultrasound examination data transferred from a medical diagnostic ultrasound imaging system.

Detailed Description Text (3):

In operation, the processor 20 causes the transmit beamformer 10 to apply a voltage to the transducer 5 to cause it to vibrate and emit an ultrasonic beam into an object, such as human tissue (i.e., a patient's body). Ultrasonic energy reflected from the body impinges on the transducer 5, and the resulting voltages created by the transducer 5 are received by the receive beamformer 15. The processor 20 processes the sensed voltages to create an ultrasound image associated with the reflected signals and displays the image on a display device (not shown). The processor 20 can also store the generated image and other ultrasound examination data in the storage device 25 (e.g., a hard drive). As used herein, the term "ultrasound examination data" is meant to broadly refer to ultrasound image data (still images and/or dynamic clips) and/or non-image data (such as calculation data and patient data) associated with an ultrasound examination.

Detailed Description Text (4):

In this preferred embodiment, the ultrasound system 100 also comprises a portable computing device interface 30, and, in operation, the processor 20 is operative to transfer ultrasound examination data from the storage device 25 to a portable computing device via the portable computing device interface 30. The portable computing device interface 30 can take any suitable form, such as, for example, a wireless communication device or a cradle that allows physical and electrical coupling between a portable computing device and the ultrasound system 100. For simplicity, the term "portable computing device" is used herein to broadly refer to any device comprising a processor and storage media that can be used to implement the embodiments described herein. While it is preferred that the portable computing device be a commercially-available, off-the-shelf product, the portable computing device can take the form of a customized device, such as one containing an application-specific processor, a wireless interface, a set of control buttons, and a storage unit (e.g., a Digital 8 micro-cassette).

Detailed Description Text (5):

Two examples of a portable computing device are a laptop computer (also known as a notebook computer) and a personal digital assistant (also known as a handheld or palmtop computer). A laptop computer is a full-fledged computer system that has a processor that typically includes an arithmetic and logical unit ("ALU"), a communications bus, connection-based network communications, rotating magnetic storage (such as a hard disk or floppy drive), and a video controller chip. A typical laptop is battery operated, weighs less than about five pounds, and has a thickness of less than about three-inches, allowing it to be transported and used in airplanes, libraries, temporary offices, and meetings. Laptop computers generally have the same capabilities as desktop computers and can be effectively turned into a desktop computer with a docking station.

Detailed Description Text (6):

In contrast to a typical laptop computer, a typical personal digital assistant (or "PDA") uses a digital signal processor ("DSP") instead of a central processor. Although a PDA contains a data storage device, it typically lacks rotating magnetic storage media. A PDA also lacks an ALU and a video controller, absorbing their functionality into the less-powerful DSP. Unlike laptop computers, PDAs run scaled-down versions of operating systems. For example, instead of using Microsoft's Windows 95/98, some PDAs use Microsoft's Windows CE, which is a small, scalable program that has a similar look-and-feel to Windows 95/98. Also unlike laptop computers which allow the same or virtually the same functionality as a desktop computer, a PDA is typically used merely to organize personal information (e.g., storing names, addresses, and phone numbers and

maintaining schedules), enter notes, and perform simple calculations. Other PDAs offer pocket-sized versions of word processing and spreadsheet applications. Additionally, while some PDAs (such as the Jornada 820 Handheld PC from Hewlett-Packard) look like a laptop computer and use a touch-typeable keyboard, other PDAs (such as Palm Inc.'s PalmPilot) are small enough to be stored in a user's pocket and use a stylus, an electronically-sensitive pad, and handwriting recognition software (e.g., Grafitti).

Detailed Description Text (7):

Many PDAs use wireless technology (e.g., an infrared communications link) to transfer data to/from other computer systems and can also include telephony components to exchange e-mail and faxes, provide paging functions, and retrieve information from the Internet. PDAs can also transfer or receive data from another computer system via a wired connection. For example, a PDA can be physically and electrically coupled with a computer via a cradle. In operation, when a user slides the PDA into the cradle, electrical contacts on the PDA physically connect with electrical contracts on the cradle, allowing data transfer or synchronization between the computer and the PDA. Instead of a cradle, a cable can be used to physically and electrically connect the two devices.

Detailed Description Text (8):

Turning again to the drawings, the ultrasound system 100 of FIG. 1 can be used in a method for transferring ultrasound examination data to a portable computing device. This preferred method will be illustrated in view of FIGS. 2 and 3. For simplicity, the preferred embodiments will be described in terms of a personal digital assistant, and the personal digital assistant interface 30 will be a wireless communication device that communicates with a wireless communication device of the personal digital assistant 150 using infrared technology. With reference to FIG. 3, a user brings the personal digital assistant 150 in the vicinity of the ultrasound system 100 and requests the transfer of ultrasound examination data from the ultrasound system 100 to the personal digital assistant 150 (act 210). In one preferred embodiment, the user issues this request by interacting with a user interface of the personal digital assistant 150. In response to this interaction, the processor of the personal digital assistant 150 issues a download command to the ultrasound system 100 via the wireless communication device of the personal digital assistant 150. In an alternate embodiment, the request is entered on the ultrasound system instead of on the personal digital assistant 150.

Detailed Description Text (9):

In response to the received download command, the processor 20 of the ultrasound system 100 wirelessly transfers ultrasound examination data stored in the storage device 25 to the personal digital assistant via the system's wireless communication device 30 (act 220). As discussed in more detail below, the processor 20 can also prepare the ultrasound examination data for transfer by changing the format of the data. While the ultrasound examination data is being wirelessly transferred, the ultrasound system 100 and/or the personal digital assistant 150 can display an activity indicator to assure the user that the transfer is in progress and to inform the user not to break the wireless link between the ultrasound system 100 and the personal digital assistant 150. When the download is complete, the ultrasound system 100 and/or the personal digital assistant 150 can display completion messages to the user, which, if preferred, can remain displayed until the user acknowledges the message. Upon completion of the transfer, the ultrasound system 100 returns to its previous state and is ready to perform another ultrasound examination.

Detailed Description Text (10):

The downloaded ultrasound examination data is stored in a storage device of the personal digital assistant 150. If the ultrasound examination data is in the proper format, it can be viewed on a display device of the personal digital assistant 150 (act 230). Depending on the application, the personal digital assistant can use standard, off-the-shelf software or custom software to view the data. In the illustration shown in FIG. 4, the personal digital assistant 150 is displaying an ultrasound image 170 and patient data 180 of the transferred ultrasound examination data on its display device 160. The display continues until the user selects another function or powers-off the device.

Detailed Description Text (12):

In another preferred embodiment, the personal digital assistant 150 is used as a "data runner" between the ultrasound system 100 and an ultrasound examination data review station. As used herein, the term "review station" is meant to broadly refer to any device to which examination data can be transferred for viewing purposes. A review

station is typically a personal computer or workstation, such as the review station 300 shown in FIG. 5. Review stations often comprise one or more display device 310, 315, user interface elements (e.g., keyboard 320 and mouse 330), and a processor 340 operative to display, review, and analyze stored or retrieved examination data. The review station 300 can also run additional software applications. It is important to note that a review station can take other forms. For example, a review station can comprise a television with an attached set-top box or its own advanced networking functionality.

Detailed Description Text (13):

Turning again to the flow chart of FIG. 2, when the user brings the personal digital assistant 150 in the vicinity of review station 300, the user can employ the interface of the personal digital assistant 150 and/or the review station 300 to begin the upload process. For example, the user, exercising the user interface of the personal digital assistant 150, can issue an upload command to the review station 300 via a wireless link, such as an infrared link. The personal digital assistant 150 then wirelessly transmits the ultrasound examination data to the review station 300, which receives the data via a wireless receiver 350 (act 240). The personal digital assistant 150 and/or the review station 300 can display activity indicators while data transfer is taking place and can display completion messages at the conclusion of the upload process. The review station 300 can then display the transferred ultrasound examination data on its display device 310, 315 (act 250). If the review station 300 is programmed with an image review application, it can display two or more exams side-by-side either to compare the conditions of different patients or to demonstrate one patient's progress under treatment. This feature can also be useful in teaching or consulting settings. The ultrasound examination data can also be incorporated into a report being prepared by another software package. If the review station 300 is a patient's home computer, the patient can use his computer to privately review his images or show his images to his family. It should be noted that these are just some of the many applications that can be used in conjunction with the transferred ultrasound examination data.

Detailed Description Text (14):

There are several advantages associated with using a personal digital assistant to transfer ultrasound examination data from an ultrasound system to a review station. First, unlike the sneakernet approach using videotapes or diskettes, the use of a personal digital assistant does not require the user to know how to operate the ultrasound system--the user merely needs to know how to operate the easy-to-use user interface of the personal digital assistant. Additionally, because many people are already using personal digital assistants for other purposes (e.g., personal information management), using a personal digital assistant to transfer examination data is an efficient use of resources and does not require additional hardware. Further, because personal digital assistants are digital and durable, they are not susceptible to many of the problems that are associated with videotape and allow transfer of examination data to computers and televisions that do not have a VCR connected to them. Finally, when stored in a computer environment, the examination data can be archived and preserved more effectively because it is kept in a standard image format.

Detailed Description Text (15):

In yet another preferred embodiment, the personal digital assistant 150 is used to transfer ultrasound examination data to a second personal digital assistant. With reference to FIGS. 2 and 6, the user brings the first personal digital assistant 150 in the vicinity of a second personal digital assistant 450. Using control software on the first or second personal digital assistants 150, 450, the user begins the upload/download process to transfer ultrasound examination data stored in the first personal digital assistant 150 to the second personal digital assistant 450 (act 260). The transferred data is stored in the second personal digital assistant 450 and can be viewed on its display device (act 270). This allows multiple users to easily exchange ultrasound examination data through wireless transfer from one personal digital assistant to another. This feature finds particular utility in hospitals and other environments where many users in a community have personal digital assistants.

Detailed Description Text (16):

There are several alternatives that can be employed with these preferred embodiments. For example, in the preferred embodiments described above, the personal digital assistant 150 communicated with the ultrasound system 100 and the review station 300 via a wireless communication link. In one alternate embodiment, instead of or in addition to using a wireless communication link, the personal digital assistant 150 receives and/or transfers ultrasound examination data through a wired connection. As



shown in the illustrations of FIGS. 7 and 8, the personal digital assistant 150 can be coupled with a cradle 600, 700 of the ultrasound system 100 and/or the review station 300. In operation, electrical contacts on the personal digital assistant 150 couple with electronic contacts on the cradle 600, 700, allowing ultrasound examination data to be transferred from one device to the other. This alternate embodiment finds particular utility in situations where a user already had a personal-digital-assistant cradle attached to his computer to synchronize data stored in his personal digital assistant with data stored in his computer. In this situation, the user can transfer ultrasound examination data to his computer without purchasing any additional hardware. In another alternate embodiment, instead of a cradle, the wired connection takes the form of a physical wire or cable that attaches at one end to the ultrasound system (or review station) and attaches at the other end to the personal digital assistant.

Detailed Description Text (17):

As noted above, the processor 20 can prepare the ultrasound examination data for transfer by changing the format of the data. In many applications, ultrasound examination data is stored in the ultrasound system using a format that is proprietary to the manufacturer of the ultrasound system. In these applications, the ultrasound system can convert the format of the data from a form readable by the ultrasound system to a form readable by the personal digital assistant or the review station, such as JPG or another suitable industry standard format. This conversion process may involve separating the colors into hue, chrominance, and saturation components and individually compressing each of these components; attaching examination information (e.g., patient name and ID, date, type of study); attaching calibration information; and attaching header data to support the DICOM standard. Although the image formatting can occur at the personal digital assistant, it is preferred that the image formatting occur at the ultrasound system since an ultrasound system typically has greater computing power than a personal digital assistant. The image formatting can also occur at the review station. Examination data formatting can also include compressing the data to reduce the time needed to transfer the image.

Detailed Description Text (18):

Because many personal digital assistants have a more limited display capability (e.g., limited screen size and resolution) as compared to ultrasound systems or review stations, additional formatting may be required to view the data on the personal digital assistant. For example, some personal digital assistants, such as the Palm Pilot, use as a native file format called PRC, which is adapted from the resource fork in older versions of MacOS. PRC is a combined format that can describe either Palm executables or visual images, and a PRC file begins with a common header block that expresses the kind and quantity of information in the file and the means by which the personal digital assistant should interpret the contents. A software program for the Palm Pilot called "Image Extractor" displays images in the PRC format and also displays images in a bitmap ("BMP") format. BMP is an old and well-known image format, and there are several free programs (such as xv and PBM) in the Linux domain that translate from JPG to BMP. Accordingly, in one preferred embodiment, after the image data is converted to a JPG format, it is converted to a BMP image and then transferred to the personal digital assistant for viewing. In another preferred embodiment, only the scale and resolution of the ultrasound image is reduced from a full-size image format to an "icon," "thumbnail," or "postage stamp" format.

Detailed Description Text (19):

In the preferred embodiments discussed above, examination data was wirelessly transferred using a wireless communication link and a wireless communication device. For simplicity, the term "wireless" has been used to broadly refer to any technology that allows the transfer of examination data from one point to another without the use of a physical connection. Because infrared technology is widely-used with PDAs and other portable computing devices, it is preferred that the wireless communication device employ infrared technology. However, other wireless technologies, such as but not limited to radio frequency, light wave, or microwave transmissions, can be used. It should also be noted that the wireless communication device can be an integral/built-in component or an add-on component (such as a detachable accessory) and that the wireless communication device can include an emitter, receiver, and/or transceiver. Further, data can be wirelessly transmitted in analog or digital form. The following two patent applications assigned to the assignee of the present invention relate to wireless transmissions and are hereby incorporated by reference: "Diagnostic Medical Ultrasound System with Wireless Communication Device" (U.S. application Ser. No. 09/237,548; filed Jan. 26, 1999, now U.S. Pat. No. 6,241,673) and "Medical Diagnostic Ultrasound Imaging System with a Wirelessly-Controlled Peripheral" (U.S. application Ser. No. 09/538,449; filed on the same day as the present patent application now U.S. Pat. No. 6,238,344).

Detailed Description Text (20):

Lastly, while the preferred embodiments were described above in terms of medical diagnostic ultrasound imaging system and ultrasound examination data, it should be understood that these preferred embodiments can be applied to any suitable medical diagnostic image acquisition device and medical examination data generated therefrom. For example, a medical diagnostic image acquisition device that employs any of the following modalities can be used: computed radiography, magnetic resonance, angiography, color flow Doppler, cystoscopy, diaphanography, echocardiography, fluoresosin angiography, laparoscopy, magnetic resonance angiography, positron emission tomography, single-photon emission computed tomography, x-ray angiography, computed tomography, nuclear medicine, biomagnetic imaging, culposcopy, duplex Doppler, digital microscopy, endoscopy, fundoscopy, laser surface scan, magnetic resonance spectroscopy, radiographic imaging, thermography, and radio fluroscopy. Further, examination data can also be transferred from medical networks, such as a medical diagnostic ultrasound imaging network, a hospital information system, or a picture archive and communication system. As with ultrasound examination data, medical examination data can comprise image and/or non-image data.

Detailed Description Text (21):

It is important to note that any of the various aspects of any of the preferred embodiments can be used alone or in combination. For example, the portable computing device that is used to transfer examination data from an ultrasound system to a review station may or may not also have the functionality to view the image. Also, as stated above, although the preferred embodiments were described in conjunction with a personal digital assistant, any type of portable computing device (such as a laptop computer) can be used.

## CLAIMS:

7. The invention of claim 1, wherein the storage device further stores calculation data associated with the ultrasound image, and wherein the processor is further operative to transfer the calculation data stored in the storage device to a personal digital assistant via the personal digital assistant interface.

8. The invention of claim 1, wherein the storage device further stores patient data associated with the ultrasound image, and wherein the processor is further operative to transfer the patient data stored in the storage device to a personal digital assistant via the personal digital assistant interface.

17. The invention of claim 9 further comprising: (d) transferring calculation data associated with the ultrasound image from the medical diagnostic ultrasound imaging system to the personal digital assistant via the personal digital assistant interface of the medical diagnostic ultrasound imaging system; (e) storing the calculation data in the personal digital assistant; and (f) displaying the calculation data on the display of the personal digital assistant.

18. The invention of claim 9 further comprising: (d) transferring patient data associated with the ultrasound image from the medical diagnostic ultrasound imaging system to the personal digital assistant via the personal digital assistant interface of the medical diagnostic ultrasound imaging system; (e) storing the patient data in the personal digital assistant; and (f) displaying the patient data on the display of the personal digital assistant.

27. The invention of claim 19 further comprising: (d) transferring calculation data associated with the ultrasound image from the medical diagnostic ultrasound imaging system to the portable computing device via the portable computing device interface of the medical diagnostic ultrasound imaging system; (e) storing the calculation data in the portable computing device; and (f) transferring the calculation data from the portable computing device to the ultrasound image review station.

28. The invention of claim 19 further comprising: (d) transferring patient data associated with the ultrasound image from the medical diagnostic ultrasound imaging system to the portable computing device via the portable computing device interface of the medical diagnostic ultrasound imaging system; (e) storing the patient data in the portable computing device; and (f) transferring the patient data from the portable computing device to the ultrasound image review station.

30. The invention of claim 29 further comprising: (d) wirelessly transferring

calculation data associated with the ultrasound image from the medical diagnostic ultrasound imaging system to the portable computing device via the wireless communication device of the medical diagnostic ultrasound imaging system; (e) storing the calculation data in the portable computing device; and (f) displaying the calculation data on the display of the portable computing device.

31. The invention of claim 29 further comprising: (d) wirelessly transferring patient data associated with the ultrasound image from the medical diagnostic ultrasound imaging system to the portable computing device via the wireless communication device of the medical diagnostic ultrasound imaging system; (e) storing the patient data in the portable computing device; and (f) displaying the patient data on the display of the portable computing device.



US006018713A

# United States Patent [19]

Coli et al.

[11] **Patent Number:** 6,018,713  
 [45] **Date of Patent:** Jan. 25, 2000

[54] **INTEGRATED SYSTEM AND METHOD FOR ORDERING AND CUMULATIVE RESULTS REPORTING OF MEDICAL TESTS**

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[21] Appl. No.: 09/057,560

[22] Filed: Apr. 9, 1998

**Related U.S. Application Data**

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[51] Int. Cl.<sup>7</sup> ..... G06F 17/60

[52] U.S. Cl. .... 705/2; 705/1; 705/3; 705/4

[58] Field of Search ..... 705/2, 3, 4, 1; 128/920; 702/19; 600/300

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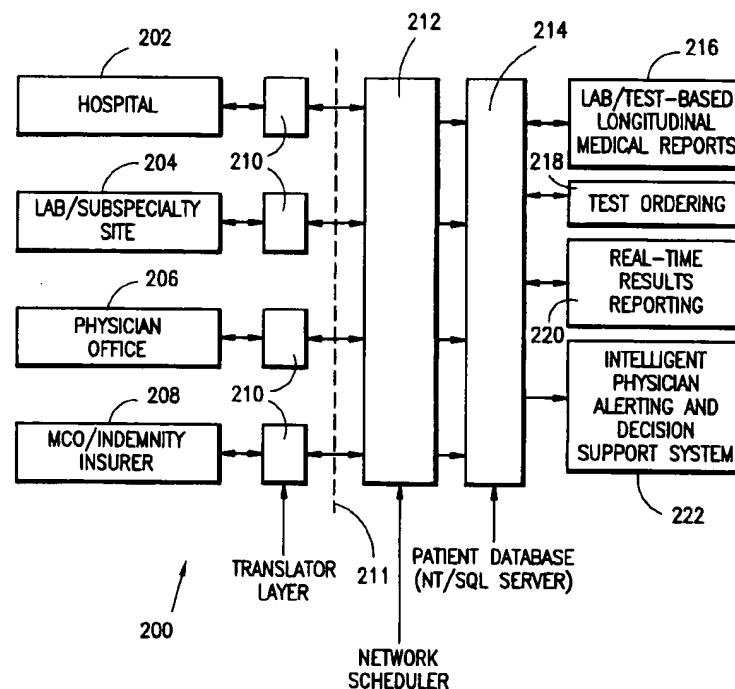
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[57] **ABSTRACT**

A network-based system and method for ordering and cumulative results reporting of medical tests includes a computer operated at a physician location (such as a hospital or physician office) to order tests, retrieve and store statistical data or status the progress of previously ordered tests, and at least one labsite computer for receiving physician requests for tests and reporting their results. The physician computer and labsite computer are interconnected by a computer network. The physician computer receives a physician or user request for ordering a test, causes a test request message to be sent to the labsite computer, causes a request for statistical data to be sent to the network, and receives statistical data from the network. The labsite computer is programmed to receive a test request message and to cause a test results message or a test status message to be sent to the physician computer.

8 Claims, 20 Drawing Sheets



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L5: Entry 39 of 69

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DOCUMENT-IDENTIFIER: US 6018713 A

TITLE: Integrated system and method for ordering and cumulative results reporting of medical tests

Brief Summary Text (5):

Health care providers, payers, information system vendors, and state governments have teamed to plan and build Health Information Networks (HINs) in at least 11 states. Simultaneously, a host of large corporations have constructed proprietary HINs for processing clinical Electronic Data Interchange (EDI) transactions, including both data and images such as x-rays. These attempts to provide informational interchange have involved all sectors of the industry. Also, the proliferation of the global network commonly referred to as the "Internet" has been used to exchange information between different entities in the health care community. Thus far, these system have been primarily limited to very specialized health care applications. For example, U.S. Pat. No. 5,715,823 discloses a medical ultrasonic diagnostic imaging system capable of being accessed over the Internet, making ultrasonic images, diagnostic reports, and ultrasound diagnostics information and operation accessible to a conventional PC.

Brief Summary Text (16):

A further objective of the invention is to provide a clinical test ordering and results reporting system wherein other layers of data may be attached to the test result output. For example, by clicking on a test, the user may retrieve a clinical description of the test or demographic information.

Brief Summary Text (24):

Following performance of the tests, the results are transmitted from the laboratory in a data stream formatted for cumulative results reporting, and displayed for the physician with an organization identical to the organization of the tests within the ordering function. This organization indexes and organizes the test results to facilitate analysis and rapid recognition of clinical patterns and trends to facilitate accurate diagnosis.

Brief Summary Text (28):

Other layers of data may be attached to the test result output. For example, by clicking on a test, the user may retrieve a clinical description of the test or demographic information. The software provided for the physician's office may include a clinical notes recording feature and a voice control feature.

Brief Summary Text (32):

In one aspect, the invention features a network-based test ordering and results reporting system that includes at least one network scheduler, at least one patient database computer, at least one hospital computer for operation by a physician or other medical specialist working in a hospital, at least one lab site/subspecialty computer for operation by a lab technician, at least one physician computer for operation by a physician or other medical specialist working in a private clinic, and at least one insurer computer for operation by an insurance claims agent. The network scheduler, patient database computer, hospital computer, lab site/subspecialty computer, physician computer, and insurer computers are interconnected by a computer network. The patient database computer is programmed to: (1) receive an access message containing the patient ID, test ID, lab ID (optional) and logon ID from a hospital computer or a physician computer; (2) evaluate an access message to determine whether a requesting computer is authorized to request/perform the particular task; (3) cause a message to be communicated to the patient's indemnity insurer requesting authorization to perform the test; (4) select an appropriate lab to conduct the test (if necessary); (5) receive an access message from the patient's indemnity insurer either authorizing or disapproving the request for indemnification; (6) cause a message to be sent to the

requesting computer informing the requester of the insurance company's decision; (7) cause a message that comprises the patient ID, patient's insurance carrier, diagnosis, and test ID to be communicated to the lab that is to conduct the test; and (8) cause a message to be communicated to the patient informing him/her of the test, location, special instructions, etc. The hospital and physician computers are programmed to: (1) receive a user request for a laboratory test; (2) identify a candidate laboratory that is qualified to conduct the test (optional); (3) cause an access message to be created that comprises the patient ID, patient's insurance carrier, diagnosis, test ID, lab ID (optional), and logon ID; (4) cause the access message to be sent to a mainframe patient database computer. The lab site/subspecialty computer is programmed to: (1) receive an access message containing the patient ID, test ID, diagnosis, and logon ID from a patient database mainframe requesting a lab test; (2) receive an access message containing the patient ID, test ID, and logon ID from a patient database computer that authorizes the lab to conduct the test; and (3) cause a message to be communicated to the lab technician to conduct the test. The insurer computer is programmed to: (1) receive an access message requesting authorization to conduct a test from a mainframe patient database computer containing a patient ID, test ID and the diagnosis; (2) cause an access message to be created that comprises the patient ID, hospital ID, test ID, authorization code, and logon ID; (3) cause the access message to be sent to the mainframe patient database computer either authorizing or denying payment for the requested test. To aid the physician or other medical specialist in completing the access message, a list of diagnosis codes is integrated into the ordering module. Following performance of the tests, the results are transmitted from the laboratory in a data stream formatted for cumulative results reporting, and displayed for the physician with an organization identical to the organization of the tests within the ordering function. This organization indexes and organizes the test results to facilitate analysis and rapid recognition of clinical patterns and trends to facilitate accurate diagnosis.

#### Brief Summary Text (39):

In another aspect, the invention features a hypertext statement system that includes a client computer for operation by a client user and one or more server computers for operation by a server user. The client computer and the server computers are interconnected by a computer network. At least one of the server computers is programmed to store patient test data records in a database. Each of the patient test data records includes a patient ID, test ID, date, observed values, and additional "notes". The server computer is programmed to transmit a statement document that includes the patient test data records to the client computer. The client computer is programmed to display the patient test data records with visual aids for identifying values outside a normal range, to receive a request from a client user to display test data corresponding to a data retrieval query input by the client user, and to cause a product hypertext link derived from a patient test data retrieval request to be activated. At least one of the server computers is programmed to respond to activation of the test data request by causing the data to be sent to the client computer. This feature permits the system to provide aggregated data and demographic information (with or without patient identification), creating "live" public health statistics through a single query across multiple hospitals, clinics, labs, and offices. This broad-based information will be useful to HMOs in cost prediction. Other layers of data may be attached to the test result output. For example, by clicking on a test, the user may retrieve a clinical description of the test or demographic information. The software provided for the physician's office may include a clinical notes recording feature and a voice control feature.

#### Detailed Description Text (6):

The system operates under control of a conventional operating system. The operating system permits various application processes to be executed including a communications application which permits data transfer with various remote terminals such as those referred to above. The communications applications permit physicians, laboratory technicians, and insurance claims agents to log onto the patient database computer, update information and create reports.

#### Detailed Description Text (11):

Referring again to FIG. 3, if test ordering is not desired, program control transfers to block 302, which executes a report generating function which will be described in more detail below. If a test is to be ordered, control transfers to block 304, where the name of the ordering physician is selected. As seen in block 304, the network first locates the physician's name and then compares the name to the physician's password, if the computer does not find a matching name or password, it denies network access to the user. After a database number of unsuccessful attempts, the network will log the

hospital or physician computer off the network. If the name and password are valid, the network prompts the user to submit a request to the network 211 to schedule a test to be conducted on a particular patient.

Detailed Description Text (12):

In block 306, the physician is prompted to enter the patient name. The network 211 searches the database of patient database computer 214 for a matching patient account. If it does not find a match, the network 211 sends a message back to the hospital computer 202 or the physician computer 206 indicating that an existing patient file does not exist. The network 211 then prompts the hospital or physician computer to input the patient's name again or to complete a new patient input form. This function is performed using a custom input screen as shown in FIG. 5. Existing patients may be selected from the list in scroll window 502, or the physician can select button 504 and enter data in fields 508 to add a new patient. Alternatively, the physician may select a lab to perform the test within this screen using scroll window 510. When the correct patient has been identified, the physician clicks on button 506 to continue. Clicking on button 506 transfers control to block 308 (shown in FIG. 3), where a desired test group is selected.

Detailed Description Text (24):

After the physician selects display or printing of test results, block 3021 is executed to verify authorization of the requester to review the information contained in a test report. When authorization is requested, a report request packet or packets containing the patient ID, test ID, and date the test was conducted (start and end dates when a report covering a period of time is requested) is transmitted to the patient database computer. When the patient database computer receives report request packets, it verifies that the report request packets originated from either a physician computer 206, or another hospital computer 202. If the message originated from a lab site/subspecialty computer 204 or an insured computer 208, the patient database computer sends a document to the originating computer indicating that the computer is attempting to execute a task it is not authorized to perform and ignores the request. Once the patient database computer verifies that the recipient computer is authorized to receive the test data, the results are transmitted from the patient database computer in a data stream formatted for cumulative results reporting, and displayed for the physician or lab technician with an organization identical to the organization of the tests within the ordering function. This technique indexes and organizes the test results to facilitate analysis and rapid recognition of clinical patterns and trends to facilitate accurate diagnosis.

Detailed Description Text (28):

Other layers of data may be attached to the test result output. For example, by clicking on a test, the user may retrieve a clinical description of the test or demographic information. The software provided for the physician's office may include a clinical notes recording feature and a voice control feature.

Detailed Description Text (30):

Execution of the client program in FIG. 13 begins with block 1300, where the user inputs his/her user name and password to log onto the system. Program control then transfers to block 1302, where the network searches the authorized users list to locate the user's name and password and compare them with the entered values. If the computer does not find a matching combination, it returns execution to block 1300 for the user to try again. After a database number of unsuccessful attempts, the network logs the terminal off the system. If the network determines that the name and password are valid, program control transfers to block 1304, where the program accepts input from the user to either update/view patient test results, or generate a report. This function is preferably performed by displaying an input screen permitting selection of one of the two possible choices.

Detailed Description Text (31):

Referring again to FIG. 13, if a laboratory technician wishes to update/view patient test results, control transfers to block 1306, where the technician is prompted to enter the patient's name and a test ID. Network 211 searches patient database computer 214 for a matching record. If it does not find a match, network 211 sends a message back to the laboratory computer 204 indicating that an existing patient file does not exist and prompts the technician to re-enter the patient name and test ID. After a predetermined number of failures, the network logs off the laboratory computer from the network. When the correct record is found, program control transfers to block 1308, where the network displays the test data input screen into which recorded values for a recently completed test can be entered into the system, either directly through

automated test equipment interfaced with computer 202 or 204 (shown in FIG. 2), or manually by an operator. In block 1310 the test results are organized in a standardized format with patient identification, date, and time identification, test result values, and any "lab notes" arranged in predetermined fields. When the laboratory technician has completed the data input, he/she transmits a database update URL containing the patient ID, test ID, test date, logon ID and formatted data to patient database computer 214 in block 1312.

Detailed Description Text (33):

Referring once again to FIG. 13, if a laboratory technician wishes to request a laboratory report of conducted or future tests, program control transfers to block 1322 where the technician is prompted to input the laboratory report desired. This function is preferably performed by displaying an input screen permitting selection of one of the two possible choices. Program control then transfers to block 1324, where the system transmits the information to the network which locates all test data that satisfies the search criteria and then outputs a report in block 1326.

Detailed Description Text (34):

FIG. 14 is a flowchart generally describing the operation of an insured computer's report generation function as operable on computer 208 (as seen in FIG. 2). Execution of the client program in FIG. 14 begins much the same way as with the hospital, physician and lab site/subspecialty computers. Once the network determines that the name and password are valid, program control transfers to block 1404, where the program accepts input from the user to generate a report. This function is preferably performed by displaying an input screen permitting input of the desired options. To print a report, an insurance company employee enters the patient ID or claim number. Execution then transfers to block 1406, where the network 211 locates all of the patient records corresponding to the patient ID or claim number and then to block 1408, where the system outputs a hardcopy report.

Detailed Description Text (49):

When one computer sends a request packet to another computer as described above, this packet may be sent in a standard HTTP (Hypertext Transfer Protocol) or FTP (file transfer protocol) request message. The request message includes components of the URL as described by the standard HTTP or FTP protocol definition. These URL components in the request message allow the server to provide a response appropriate to the URL. The term "URL" as used in the present applications as an example of a "link" which is a pointer to another document or form (including multimedia documents, hypertext documents including other links, or audio/video documents). In this preferred embodiment, documents are transferred to the requesting computer in the form of a success HTTP or FTP response message whereupon the document is packetized and transferred to the requesting computer. When a server sends an account name and password request message to the client, in a preferred embodiment, the account name and password request message is an unauthorized HTTP response. A client computer sends account name and password information to a server as part of an access request message.

Detailed Description Text (50):

In this preferred internet-based embodiment, the software operating features and screens described previously may be implemented using a webbrowser interface. FIG. 19a shows a screen display 1900 for a browser based test ordering and results reporting system. This interface may be implemented using Hyper Text Markup Language, for access using the Netscape or Microsoft Internet Explorer browsers. Screen display 1900 includes a browser control panel 1901 at the top of the screen, a control frame 1902, and a display frame 1904. Control frame 1902 contains test results viewing and test ordering selection links organized in the manner described previously for each category of tests. Control frame 1902 preferably includes a "table of contents" with internal links to specific headings for ease of use. For example, control frame 1902 may include, for a particular patient, internal links to microchem tests and subspecialty tests categories. Upon selecting the microchem tests internal link, links corresponding to each one of multiple test subcategories provided for the microchem tests category are provided in control frame 1902 such as, but not limited to, basic hematology, urinalysis, basic chemistry, special chemistry, and microbiology. Further, upon selection of one of these individual subcategory test links within a test category, links corresponding to the individual test or image ordering choices available for the selected subcategory test are provided in control frame 1902 listed either individually or under alphabetical grouping, or in combination thereof. For example, selection of the basic hematology subcategory link within the microchem test category results in HEMOGRAM, DIFF/MORPH, MSCL, or COAG individual test links, as well as links to other



individual tests grouped by letter of the alphabet (e.g., "A", "B", etc.), being provided in control frame 1902. Selection of the urinalysis, basic chemistry, special chemistry, or microbiology subcategory links results in a similar display of the individual test links associated with the selected subcategory being provided in control frame 1902. In addition, links associated with a subcategory may include links to images as well as thumbnail pictures of images. Display frame 1904 is used to display the test ordering information and test results obtained by selecting links from control frame 1902. If links for test results are selected, test results in the corresponding category are displayed in display frame 1904. FIG. 20 provides an example of such a test results display for basic hematology test results. Referring now to FIG. 20, test results for a particular patient or test subject are preferably displayed in a spreadsheet format in which results for the individual tests are grouped into columns, and in which each row indicates the particular results for one or more individual tests associated with a particular date and time. Column headings are provided to indicate, without limitation, identification of individual tests for which results are provided (e.g., WBC, RBC, Polys, Bands), one or more displayed test categories (e.g., BASIC HEMATOLOGY), one, or more displayed test subcategories (e.g., HEMOGRAM, DIFF/MORPH), date, and timer. For numeric test results, the unit of measurement associated with each test result is indicated. Test results for other categories of tests are displayed in a similar manner. Displayed test results may also include, without limitation, footnotes, lab notes text or notations, images, or other clinical or diagnostic written (or transcribed) comments or observations produced by physicians or technicians.

#### CLAIMS:

1. A network-based test ordering and results reporting system comprising:

medical computing means for computing at a location where medical services are rendered;

test ordering means associated with said medical computing means for displaying a set of available medical laboratory tests in an ordered fashion and permitting designation by an authorized operator of at least one selected test to be performed on an identified patient;

laboratory selection means associated with said medical computing means for retrieving information defining a plurality of laboratories and their testing capabilities, displaying a set of one or more geographically dispersed laboratories capable of performing said selected test, and receiving an identification by said authorized operator of a selected laboratory;

laboratory computing means for computing at said selected laboratory;

data transmission means connected to said medical computing means and said laboratory computing means for transmitting a test order identifying said selected test and patient to said laboratory computing means located at said selected laboratory;

test order processing means associated with the laboratory computing means for receiving said test order, storing said test order, and providing said test order to laboratory personnel; and

results reporting means associated with the laboratory computing means for receiving test results from the laboratory, storing said test results, and selectively transmitting said test results to said medical computing means.

7. A network-based test ordering and results reporting system comprising:

medical computing means for computing at a location where medical services are rendered;

test ordering means associated with said medical computing means for displaying a set of available medical laboratory tests in an ordered fashion and permitting designation by an authorized operator of at least one selected test to be performed on an identified patient;

laboratory selection means associated with said medical computing means for retrieving information defining a plurality of laboratories and their testing capabilities, displaying a set of one or more geographically dispersed laboratories capable of performing said selected test, and receiving an identification by said authorized

operator of a selected laboratory;

laboratory computing means for computing at said selected laboratory;

data transmission means connected to said medical computing means and said laboratory computing means for transmitting a test order identifying said selected test and patient to said laboratory computing means located at said selected laboratory;

test order processing means associated with the laboratory computing means for receiving said test order, storing said test order, and providing said test order to laboratory personnel;

results reporting means associated with the laboratory computing means for receiving test results from the laboratory, storing said test results, and selectively transmitting said test results to said medical computing means;

results display means associated with the medical computing means for displaying the test results;

treatment information storage means connected to the medical computing means for recording treatment information records identifying drugs or medical devices that may be needed by a patient, diagnostic indicia for such drugs or medical devices, and a display element for suggesting consideration of said drugs or medical devices;

display means for accessing said treatment information storage means, and based on displayed test results, displaying said display element associated with a drug or medical device having a diagnostic indicia indicated by said displayed test results.

**WEST**[Generate Collection](#)[Print](#)**Search Results - Record(s) 1 through 50 of 69 returned.**☐ 1. Document ID: US 20020080392 A1

L5: Entry 1 of 69

File: PGPB

Jun 27, 2002

PGPUB-DOCUMENT-NUMBER: 20020080392

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20020080392 A1

TITLE: Medical image processing system

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	RMC	Draw Desc	Image
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☐ 2. Document ID: US 20020077787 A1

L5: Entry 2 of 69

File: PGPB

Jun 20, 2002

PGPUB-DOCUMENT-NUMBER: 20020077787

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20020077787 A1

TITLE: Textual and graphical demarcation of location, and interpretation of measurements

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	RMC	Draw Desc	Image
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☐ 3. Document ID: US 20020077547 A1

L5: Entry 3 of 69

File: PGPB

Jun 20, 2002

PGPUB-DOCUMENT-NUMBER: 20020077547

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20020077547 A1

TITLE: Data entry and setup system and method for ultrasound imaging

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	RMC	Draw Desc	Image
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☐ 4. Document ID: US 20020059049 A1

L5: Entry 4 of 69

File: PGPB

May 16, 2002

PGPUB-DOCUMENT-NUMBER: 20020059049

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20020059049 A1

TITLE: System and method for rapidly customizing design, manufacture and/or selection of biomedical devices

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	AMC	Draw Desc	Image
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☐ 5. Document ID: US 20020052875 A1

L5: Entry 5 of 69

File: PGPB

May 2, 2002

PGPUB-DOCUMENT-NUMBER: 20020052875  
PGPUB-FILING-TYPE: new  
DOCUMENT-IDENTIFIER: US 20020052875 A1

TITLE: Method and apparatus for producing and accessing composite data using a device having a distributed communication controller interface

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Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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AMC	Draw Desc	Image
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☐ 6. Document ID: US 20020052866 A1

L5: Entry 6 of 69

File: PGPB

May 2, 2002

PGPUB-DOCUMENT-NUMBER: 20020052866  
PGPUB-FILING-TYPE: new  
DOCUMENT-IDENTIFIER: US 20020052866 A1

TITLE: Methods and apparatus for streaming DICOM images through data element sources and sinks

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Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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AMC	Draw Desc	Image
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☐ 7. Document ID: US 20020049436 A1

L5: Entry 7 of 69

File: PGPB

Apr 25, 2002

PGPUB-DOCUMENT-NUMBER: 20020049436  
PGPUB-FILING-TYPE: new  
DOCUMENT-IDENTIFIER: US 20020049436 A1

TITLE: Multiple cryoprobe apparatus and method

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Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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AMC	Draw Desc	Image
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☐ 8. Document ID: US 20020016545 A1

L5: Entry 8 of 69

File: PGPB

Feb 7, 2002

PGPUB-DOCUMENT-NUMBER: 20020016545  
PGPUB-FILING-TYPE: new  
DOCUMENT-IDENTIFIER: US 20020016545 A1

TITLE: Mobile ultrasound diagnostic instrument and system using wireless video transmission

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Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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AMC	Draw Desc	Image
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☐ 9. Document ID: US 20020007294 A1

L5: Entry 9 of 69

File: PGPB

Jan 17, 2002

PGPUB-DOCUMENT-NUMBER: 20020007294

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20020007294 A1

TITLE: System and method for rapidly customizing a design and remotely manufacturing biomedical devices using a computer system

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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KWIC	Draw Desc	Image
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☐ 10. Document ID: US 20010052933 A1

L5: Entry 10 of 69

File: PGPB

Dec 20, 2001

PGPUB-DOCUMENT-NUMBER: 20010052933

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20010052933 A1

TITLE: System and method for image capture, storage and retrieval

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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KWIC	Draw Desc	Image
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☐ 11. Document ID: US 6442416 B1

L5: Entry 11 of 69

File: USPT

Aug 27, 2002

US-PAT-NO: 6442416

DOCUMENT-IDENTIFIER: US 6442416 B1

TITLE: Determination of the position and orientation of at least one object in space

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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KWIC	Draw Desc	Image
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☐ 12. Document ID: US 6440072 B1

L5: Entry 12 of 69

File: USPT

Aug 27, 2002

US-PAT-NO: 6440072

DOCUMENT-IDENTIFIER: US 6440072 B1

TITLE: Medical diagnostic ultrasound imaging system and method for transferring ultrasound examination data to a portable computing device

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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KWIC	Draw Desc	Image
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☐ 13. Document ID: US 6438405 B1

L5: Entry 13 of 69

File: USPT

Aug 20, 2002

US-PAT-NO: 6438405

DOCUMENT-IDENTIFIER: US 6438405 B1

TITLE: Imaging safety device

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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RMIC	Draw Desc	Image
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☐ 14. Document ID: US 6436039 B1

L5: Entry 14 of 69

File: USPT

Aug 20, 2002

US-PAT-NO: 6436039

DOCUMENT-IDENTIFIER: US 6436039 B1

TITLE: Medicial diagnostic ultrasound system and method

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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RMIC	Draw Desc	Image
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☐ 15. Document ID: US 6425865 B1

L5: Entry 15 of 69

File: USPT

Jul 30, 2002

US-PAT-NO: 6425865

DOCUMENT-IDENTIFIER: US 6425865 B1

TITLE: Robotically assisted medical ultrasound

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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RMIC	Draw Desc	Image
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☐ 16. Document ID: US 6417870 B1

L5: Entry 16 of 69

File: USPT

Jul 9, 2002

US-PAT-NO: 6417870

DOCUMENT-IDENTIFIER: US 6417870 B1

TITLE: Method and apparatus for simultaneous construction of multiple data objects for image transfer

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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RMIC	Draw Desc	Image
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☐ 17. Document ID: US 6388687 B1

L5: Entry 17 of 69

File: USPT

May 14, 2002

US-PAT-NO: 6388687

DOCUMENT-IDENTIFIER: US 6388687 B1

TITLE: Operator-interactive display menu showing status of image transfer to remotely located devices

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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RMIC	Draw Desc	Image
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☐ 18. Document ID: US 6381418 B1

L5: Entry 18 of 69

File: USPT

Apr 30, 2002

US-PAT-NO: 6381418

DOCUMENT-IDENTIFIER: US 6381418 B1

TITLE: Print having information associated with the print stored in a memory coupled to the print

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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RMK	Draw Desc	Image
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☐ 19. Document ID: US 6352511 B1

L5: Entry 19 of 69

File: USPT

Mar 5, 2002

US-PAT-NO: 6352511

DOCUMENT-IDENTIFIER: US 6352511 B1

TITLE: Medical diagnostic ultrasound system and method for post processing

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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RMK	Draw Desc	Image
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☐ 20. Document ID: US 6351547 B1

L5: Entry 20 of 69

File: USPT

Feb 26, 2002

US-PAT-NO: 6351547

DOCUMENT-IDENTIFIER: US 6351547 B1

TITLE: Method and apparatus for formatting digital images to conform to communications standard

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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RMK	Draw Desc	Image
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☐ 21. Document ID: US 6350239 B1

L5: Entry 21 of 69

File: USPT

Feb 26, 2002

US-PAT-NO: 6350239

DOCUMENT-IDENTIFIER: US 6350239 B1

TITLE: Method and apparatus for distributed software architecture for medical diagnostic systems

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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RMK	Draw Desc	Image
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☐ 22. Document ID: US 6322505 B1

L5: Entry 22 of 69

File: USPT

Nov 27, 2001

US-PAT-NO: 6322505

DOCUMENT-IDENTIFIER: US 6322505 B1

TITLE: Medical diagnostic ultrasound system and method for post processing

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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RMK	Draw Desc	Image
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☐ 23. Document ID: US 6317137 B1

L5: Entry 23 of 69

File: USPT

Nov 13, 2001

US-PAT-NO: 6317137

DOCUMENT-IDENTIFIER: US 6317137 B1

TITLE: Multi-threaded texture modulation for axis-aligned volume rendering

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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MMVC	Draw Desc	Image
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☐ 24. Document ID: US 6312381 B1

L5: Entry 24 of 69

File: USPT

Nov 6, 2001

US-PAT-NO: 6312381

DOCUMENT-IDENTIFIER: US 6312381 B1

TITLE: Medical diagnostic ultrasound system and method

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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MMVC	Draw Desc	Image
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☐ 25. Document ID: US 6311089 B1

L5: Entry 25 of 69

File: USPT

Oct 30, 2001

US-PAT-NO: 6311089

DOCUMENT-IDENTIFIER: US 6311089 B1

TITLE: Implantable stimulation device and method for determining ventricular and atrial sensitivity thresholds

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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MMVC	Draw Desc	Image
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☐ 26. Document ID: US 6285908 B1

L5: Entry 26 of 69

File: USPT

Sep 4, 2001

US-PAT-NO: 6285908

DOCUMENT-IDENTIFIER: US 6285908 B1

TITLE: Implantable stimulation device and method for determining atrial autocapture using programmable AV delay

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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MMVC	Draw Desc	Image
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☐ 27. Document ID: US 6275869 B1

L5: Entry 27 of 69

File: USPT

Aug 14, 2001

US-PAT-NO: 6275869

DOCUMENT-IDENTIFIER: US 6275869 B1

TITLE: System for network communication of image information between imaging devices according to multiple protocols



Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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MMC	Draw Desc	Image
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☐ 28. Document ID: US 6273858 B1

L5: Entry 28 of 69

File: USPT

Aug 14, 2001

US-PAT-NO: 6273858

DOCUMENT-IDENTIFIER: US 6273858 B1

TITLE: Systems and methods for providing radiation therapy and catheter guides

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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MMC	Draw Desc	Image
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☐ 29. Document ID: US 6272470 B1

L5: Entry 29 of 69

File: USPT

Aug 7, 2001

US-PAT-NO: 6272470

DOCUMENT-IDENTIFIER: US 6272470 B1

TITLE: Electronic clinical recording system

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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MMC	Draw Desc	Image
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☐ 30. Document ID: US 6263244 B1

L5: Entry 30 of 69

File: USPT

Jul 17, 2001

US-PAT-NO: 6263244

DOCUMENT-IDENTIFIER: US 6263244 B1

TITLE: Implantable stimulation device and method for determining atrial autocapture using PVC response

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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MMC	Draw Desc	Image
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☐ 31. Document ID: US 6259950 B1

L5: Entry 31 of 69

File: USPT

Jul 10, 2001

US-PAT-NO: 6259950

DOCUMENT-IDENTIFIER: US 6259950 B1

TITLE: Implantable stimulation device and method for determining a trial autocapture using backup atrial stimulation

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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MMC	Draw Desc	Image
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☐ 32. Document ID: US 6253214 B1

L5: Entry 32 of 69

File: USPT

Jun 26, 2001

US-PAT-NO: 6253214

DOCUMENT-IDENTIFIER: US 6253214 B1

TITLE: Ultrasound image information archiving system

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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RMAC	Draw Desc	Image
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☐ 33. Document ID: US 6243606 B1

L5: Entry 33 of 69

File: USPT

Jun 5, 2001

US-PAT-NO: 6243606

DOCUMENT-IDENTIFIER: US 6243606 B1

TITLE: Implantable stimulation device and method for determining atrial autocapture using programmable PVARP

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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RMAC	Draw Desc	Image
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☐ 34. Document ID: US 6159150 A

L5: Entry 34 of 69

File: USPT

Dec 12, 2000

US-PAT-NO: 6159150

DOCUMENT-IDENTIFIER: US 6159150 A

TITLE: Medical diagnostic ultrasonic imaging system with auxiliary processor

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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RMAC	Draw Desc	Image
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☐ 35. Document ID: US 6148095 A

L5: Entry 35 of 69

File: USPT

Nov 14, 2000

US-PAT-NO: 6148095

DOCUMENT-IDENTIFIER: US 6148095 A

TITLE: Apparatus and method for determining three-dimensional representations of tortuous vessels

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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RMAC	Draw Desc	Image
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☐ 36. Document ID: US 6122538 A

L5: Entry 36 of 69

File: USPT

Sep 19, 2000

US-PAT-NO: 6122538

DOCUMENT-IDENTIFIER: US 6122538 A

TITLE: Motion--Monitoring method and system for medical devices

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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RMAC	Draw Desc	Image
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☒ 37. Document ID: US 6117079 A

L5: Entry 37 of 69

File: USPT

Sep 12, 2000

US-PAT-NO: 6117079

DOCUMENT-IDENTIFIER: US 6117079 A

TITLE: Method and apparatus for handling image data after unsuccessful transfer to  
remotely located device

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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FORM	Draw Desc	Image
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☐ 38. Document ID: US 6083167 A

L5: Entry 38 of 69

File: USPT

Jul 4, 2000

US-PAT-NO: 6083167

DOCUMENT-IDENTIFIER: US 6083167 A

TITLE: Systems and methods for providing radiation therapy and catheter guides

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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FORM	Draw Desc	Image
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☐ 39. Document ID: US 6018713 A

L5: Entry 39 of 69

File: USPT

Jan 25, 2000

US-PAT-NO: 6018713

DOCUMENT-IDENTIFIER: US 6018713 A

TITLE: Integrated system and method for ordering and cumulative results reporting of  
medical tests

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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FORM	Draw Desc	Image
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☐ 40. Document ID: US 5987349 A

L5: Entry 40 of 69

File: USPT

Nov 16, 1999

US-PAT-NO: 5987349

DOCUMENT-IDENTIFIER: US 5987349 A

TITLE: Method for determining the position and orientation of two moveable objects in  
three-dimensional space

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
------	-------	----------	-------	--------	----------------	------	-----------	-----------	-------------

FORM	Draw Desc	Image
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☐ 41. Document ID: US 5933607 A

L5: Entry 41 of 69

File: USPT

Aug 3, 1999

US-PAT-NO: 5933607

DOCUMENT-IDENTIFIER: US 5933607 A

TITLE: Digital communication system for simultaneous transmission of data from constant  
and variable rate sources

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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FORM	Draw Desc	Image
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☐ 42. Document ID: US 5920395 A

L5: Entry 42 of 69

File: USPT

Jul 6, 1999

US-PAT-NO: 5920395

DOCUMENT-IDENTIFIER: US 5920395 A

TITLE: System for locating relative positions of objects in three dimensional space

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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KWIC	Draw Desc	Image
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☐ 43. Document ID: US 5891178 A

L5: Entry 43 of 69

File: USPT

Apr 6, 1999

US-PAT-NO: 5891178

DOCUMENT-IDENTIFIER: US 5891178 A

TITLE: Programmer system and associated methods for rapidly evaluating and programming an implanted cardiac device

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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KWIC	Draw Desc	Image
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☐ 44. Document ID: US 5833623 A

L5: Entry 44 of 69

File: USPT

Nov 10, 1998

US-PAT-NO: 5833623

DOCUMENT-IDENTIFIER: US 5833623 A

TITLE: System and method for facilitating rapid retrieval and evaluation of diagnostic data stored by an implantable medical device

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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KWIC	Draw Desc	Image
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☐ 45. Document ID: US 5765010 A

L5: Entry 45 of 69

File: USPT

Jun 9, 1998

US-PAT-NO: 5765010

DOCUMENT-IDENTIFIER: US 5765010 A

TITLE: Timing and control circuit and method for a synchronous vector processor

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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KWIC	Draw Desc	Image
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☐ 46. Document ID: US 5751243 A

L5: Entry 46 of 69

File: USPT

May 12, 1998

US-PAT-NO: 5751243

DOCUMENT-IDENTIFIER: US 5751243 A

TITLE: Image synthesis using time sequential holography

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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RWMC	Draw Desc	Image
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☐ 47. Document ID: US 5739691 A

L5: Entry 47 of 69

File: USPT

Apr 14, 1998

US-PAT-NO: 5739691

DOCUMENT-IDENTIFIER: US 5739691 A

TITLE: Multi-frequency digital low pass filter for magnetic resonance imaging

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
------	-------	----------	-------	--------	----------------	------	-----------	-----------	-------------

RWMC	Draw Desc	Image
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☐ 48. Document ID: US 5736958 A

L5: Entry 48 of 69

File: USPT

Apr 7, 1998

US-PAT-NO: 5736958

DOCUMENT-IDENTIFIER: US 5736958 A

TITLE: Image synthesis using time sequential holography

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
------	-------	----------	-------	--------	----------------	------	-----------	-----------	-------------

RWMC	Draw Desc	Image
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☐ 49. Document ID: US 5734915 A

L5: Entry 49 of 69

File: USPT

Mar 31, 1998

US-PAT-NO: 5734915

DOCUMENT-IDENTIFIER: US 5734915 A

TITLE: Method and apparatus for composing digital medical imagery

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
------	-------	----------	-------	--------	----------------	------	-----------	-----------	-------------

RWMC	Draw Desc	Image
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☐ 50. Document ID: US 5680600 A

L5: Entry 50 of 69

File: USPT

Oct 21, 1997

US-PAT-NO: 5680600

DOCUMENT-IDENTIFIER: US 5680600 A

TITLE: Electronic circuit for reducing controller memory requirements

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
------	-------	----------	-------	--------	----------------	------	-----------	-----------	-------------

RWMC	Draw Desc	Image
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L4 and (transfer\$6 or transmit\$6) same (data or fil\$3)	69

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L4 and (transfer\$6 or transmit\$6) same (data or fil\$3)	69

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<u>L5</u>	L4 and (transfer\$6 or transmit\$6) same (data or fil\$3)	69	<u>L5</u>
<u>L4</u>	L2 and (program\$6 or software or operat\$3 adj system or driv\$3) same (control\$6 or adjust\$6)	102	<u>L4</u>
<u>L3</u>	L2 and network\$3 same (manag\$3 or execut\$6) same (transfer\$6 or transmit\$6) same (data or fil\$3)	9	<u>L3</u>
<u>L2</u>	L1 and (exam\$ or terminolog\$6 or list\$3) same (description or describ\$3)	149	<u>L2</u>
<u>L1</u>	(display\$3 or imag\$4) same (ultra-sound or ultrasound) same (medical or hospital) same (computer\$6 or network\$6 or LAN or local area network or WAN or wide area network)	440	<u>L1</u>

END OF SEARCH HISTORY

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L6: Entry 2 of 6

File: USPT

Aug 7, 2001

DOCUMENT-IDENTIFIER: US 6272470 B1  
TITLE: Electronic clinical recording system

Brief Summary Text (31):

If necessary, the results of past consultation records and periodical physical checkups are listed. The results of a consultation record and periodical physical checkup which may have relation are selected and displayed. At this time, if link information of the consultation record indicates external information, remote data is accessed according to the link information and acquired. A remote data acquiring/ referencing means is in practice the file transfer protocol (FTP), the protocol DICOM, a protocol for electronic mail, the hyper text transfer protocol (HTTP), or the protocol Telnet. When data is compressed and encrypted, a data extracting/decrypting means processes received data. As soon as processing is completed, resultant data is displayed together with or separately from the consultation record. A writing means is used to store consultation records in a patient card one by one or all at once. For entering and editing a consultation record, an SGML/HTML editor that is an editor conformable to the SGML or HTML is employed. Even when a consultation record is merely referenced, a date of reference and the name of an operator (physician) specified by an operator specifying means are automatically appended to and recorded in the consultation record. This makes it possible to prevent an incident such as leakage of personal information caused by impaired morals.

Detailed Description Text (5):

The diagnostic medical imaging modality 1 includes a diagnostic ultrasound system, endoscope system, diagnostic X-ray system, CT system, and MR system. The image server 2 is a computer system for managing information of medical images, and comprises a recording apparatus and a communication means enabling data transfer using the network as a medium. The recording apparatus may be a magneto-optical disk (MO) drive, hard disk drive (HDD), digital video disk (DVD) drive, or a portable disk (PD) drive. The electronic clinical recording system 3 starts operating with insertion of a patient card (health care, medical care, or welfare card) 6 serving as a clinical recording carried by a patient himself/herself.

Detailed Description Text (6):

For transferring data in response to a request made by the electronic clinical recording system 3 in hospital B, an FTP demon that is a demon conformable to the FTP, a DICOM demon that is a demon conformable to the protocol DICOM, a mail demon that is a demon conformable to a protocol for electronic mail, an HTTP demon that is a demon conformable to the HTTP, or a Telnet demon that is a demon conformable to the protocol Telnet, or a combination of them is running on the image server 2 and electronic clinical recording system 3 in hospital A. Images produced by the diagnostic medical imaging modality 1 are transferred to the image server 2 over the network or via an offline medium (for example, a magneto-optical disk).

Detailed Description Text (9):

The display unit 7 displays information of medical images represented by a still image, motion picture, and graphic information, and information of a text represented by characters and symbols. For the illustrated display unit 7, a CRT display is adopted. Alternatively, a liquid-crystal panel or television set will do. The input unit 8 is a keyboard enabling direct entry of characters, symbols, and programming data or enabling conversion of input characters into kana and kanji characters. The pointing device 9 is a mouse, trackball, touch-sensitive panel, or tablet. The computer body 10 is designed to control and manage the units and process data, and composed of a CPU, a memory, a storage unit 22, and others. The storage unit 22 is made by combining any of a magneto-optical (MO) disk drive, hard disk drive (HDD), digital video disk (DVD) drive, and portable disk (PD) drive.



Detailed Description Text (14):

Moreover, the electronic clinical recording system 3 includes, in addition to the foregoing components, a communication means 17 through which the electronic clinical recording system 3 is connected on a wire or wireless LAN, the ISDN, a general public switched line, a cable television line, a leased line, or the like, and which enables data transfer using a network as a medium.

Detailed Description Text (18):

FIGS. 3 and 4 each show the data structure to consultation records. The consultation record is composed of a plurality of plain text files containing texts written in SGML or HTML, and a group of data files containing various data items. The HTML supports a description facilitating reference of an external file. Not only characters but also a still image, motion picture, voice, chart, and list can therefore be handled at the same time. Using a WWW browser, multimedia information can be viewed in a style that is the same among various models of computers or OSs. A specified WWW browser makes it possible to download a program written in Java or Visual Basic or a program written in JavaScript typical of a scripting language to the WWW browser, and to then execute the program.

Detailed Description Text (32):

If the consultation is the second or subsequent consultation, the processing of steps 110 to 115 in FIG. 6 is executed sequentially. The electronic clinical recording system 3 carries out, as mentioned above, input mode selection and sets the addition mode (step 110). The details of mode selection are described in the above description of the flowchart of FIG. 8. The contents of a patient card are read and listed (steps 111 and 112). Thereafter, the consultation record of any previous consultation is displayed (step 113), and information of a present consultation is input (step 114). The updated consultation record is then written in the patient card and stored therein (step 115).

Detailed Description Text (44):

FIG. 10 outlines a method in which the FTP is used as a protocol for data exchange. The description will proceed on the assumption that a consultation record produced at hospital A is displayed using the electronic clinical recording system at hospital B. In a consultation record, link information indicating that examination-related images are stored in the image server at hospital A shall be described as follows:

Detailed Description Text (46):

When the mouse button is clicked in "MR exam." within a WWW browser, the WWW browser requests the image server at hospital A to establish an FTP-based connection. The image server activates an INET demon that is a demon conformable to the protocol INET or the FTP demon so as to establish a communication connection. A User command or Pass command is transmitted and login is executed. A Binary command is then transmitted in order to change transfer modes. A Get command is then transmitted, thus asking transfer of a file "image/slicel.jpeg". Finally, a Quit command is transmitted in order to release the connection. Since the identifier of a received file name indicates images, an image viewer is activated in order to display the contents of the file. Thus, examination-related images in the image server at hospital A can be referenced.

Detailed Description Text (47):

FIG. 11 outlines a method in which the HTTP is used as a protocol for data exchange. The description will proceed on the assumption that a consultation record produced at hospital A is displayed using the electronic clinical recording system at hospital B. In the consultation record, link information indicating that examination-related images are stored in the image server at hospital A shall be described as follows:

Detailed Description Text (50):

For displaying the consultation record within a WWW browser, the WWW browser requests the image server at hospital A to establish an HTTP-based connection. The HTTP demon operating on the image server establishes a communication connection in response to the request. Transfer of a file "images/slicel.jpeg" is requested. After the transfer is completed, the connection is released. Since the identifier of the received file name indicates images, the images appear in a page, in which the consultation record is displayed, within the WWW browser. As a result, the examination-related images in the image server at hospital A can be referenced.

Detailed Description Text (51):

FIG. 12 outlines a method in which a protocol for electronic mail is used as a protocol for data exchange. The description will proceed on the assumption that a consultation

record produced at hospital A is displayed using the electronic clinical recording system at hospital B. In the consultation record, link information indicating that examination-related images are stored in the image server at hospital A shall be described as follows:

Detailed Description Text (53):

When the mouse button is clicked in "MR exam." within a WWW browser, an electronic mail saying that a file "images/slicel.jpeg" is needed is created within the WWW browser and transmitted to an address "operator@hospital-A.co.jp." The electronic mail arrived at the image server in hospital A is detected by a program for checking the arrival of electronic mail which is activated periodically by a CRON demon that is a demon conformable to the protocol CRON. The contents of the mail are analyzed, and a return mail is transmitted with a text file into which a binary file "images/slicel.j.jpeg" is converted added thereto. Even in the electronic clinical recording system, the arrival of the electronic mail is detected, the contents of the mail are analyzed, and text-to-binary conversion is carried out. Since the identifier of the file indicates images, the image viewer is activated in order to display the examination-related images. Thus, the examination-related images in the image server at hospital A can be referenced.

Detailed Description Text (54):

When the position of "MR exam." on the WWW browser is clicked with the mouse button, an electronic statement indicative of an "images/slicel.jpeg" file is desired is made and transmitted from the WWW browser to the destination of "operator@hospital-A.co.jp". The electronic mail arrival at the image server of the hospital A is detected and analyzed in terms of its content by a program, which is booted up regularly by a CRON demon, for checking the arrival of the electronic mail. The "images/slicel.jpeg" file is binary/text-converted and added to a return mail, which will be transmitted. In the electronic clinical recording system, the electronic mail arrival likewise is detected, analyzed in terms of its content, and text/binary-converted. Since the extension of the file represents an image, an image viewer is booted up, and the examination image is displayed, which makes it possible to make reference to examination images in the image server of the hospital A.

Detailed Description Text (55):

FIG. 13 shows the outline of a manner with which a DICOM is used as a protocol for transmitting and receiving data. This exemplifies a situation in which examined records preserved at the hospital A are displayed by the electronic clinical recording system of the hospital B. The consultation records are to include link information indicative of examination images stored in the image server of the hospital A, which is described as follows:

Detailed Description Text (57):

When the position of "MR exam." on the WWW browser is clicked with the mouse button, the WWW browser requests the establishment of a HTTP connection to the image server of the hospital A. The HTTP demon operating on the image server establishes the communication connection in response to the request. The demon receives not only a "bin/dicom.html" file but also a group of class files of the JAVA applet referred by the "bin/dicom.html" file, and then releases the communication connection. The JAVA applet has a DICOM client function and an image display function. In the "bin/dicom.html" file, an internet address of a computer to be connected, a port number, and information for identifying files to be transferred are described with PARAM tags. On the WWW browser, in the case of displaying HTML files, the JAVA applet is interpreted and performed, and a connection request is made to a DICOM demon operating in the image server of the hospital A. The DICOM demon establishes a communication connection in response to the request, and releases the communication connection after reception of designated images. The JAVA applet depicts the received images on pages on which the consultation records are displayed. This permits reference to be made to the examination images stored in the image server of the hospital A.

Detailed Description Text (60):

When the position of "blood pressure data" on the WWW browser is clicked with the mouse button, the WWW browser requests the establishment of a HTTP connection to the image server of the hospital A. The HTTP demon operating on the image server establishes the communication connection in response to the request. The demon receives not only a "bin/telnet.html" file but also a group of class files of the JAVA applet referred by the "bin/telnet.html" file, and then releases the communication connection. The JAVA applet has a TELNET client function. In the "telnet.html" file an internet address of a computer to be connected, a login name, a password, a command name for making reference

to data, and file names to be referred are described with PARAM tags. On the WWW browser, in the case of displaying HTML files, the JAVA applet is interpreted and performed, and a connection request is made to a TELNET demon operating in the image server of the hospital A. The TELNET demon establishes a communication connection in response to the request, transmits a USER command and a PASS command, and carries out a login procedure. Subsequently, the demon performs a command making reference to designated files, and displays the performed results on pages on which the consultation records are displayed. And upon receiving an end request initiated from the user, the demon sends out a QUIT command to open the communication connection. This permits reference to be made to the blood pressure data stored in the image server of the hospital A.

Detailed Description Text (62):

For performing data encrypting/decrypting, a wide range of manners possibilities are available, including a DES (Data Encryption Standard) which is the most widely used public key encryption. For example, in the case that software referred to as PGP (Pretty Good Privacy) is used as a means for encrypting/decrypting, individual public keys are first mutually exchanged between users who transmit and receive data. Then processing for encrypting is performed for a file to be transferred using public key information of itself, thereby an extension of "FILENAME .pgp" being added to the encrypted file. When the encrypted file is acquired through a medium such as a network, processing for decrypting is performed using the public key information which was used for the encrypting.

Detailed Description Text (69):

(2) Where examination using the diagnostic medical imaging modality 1 is carried out at an examination room of the hospital A, acquired image data are transferred from the modality 1 to the image server 2 through the in-house LAN 4 and are administered therein.

Current US Original Classification (1):

705/3

Current US Cross Reference Classification (1):

705/2

CLAIMS:

15. The system of claim 8, wherein the means for acquiring or referencing acquires or references the one or more patient consultation data files on the basis of at least one of protocols of an FTP (File Transfer Protocol), DICOM (Digital Imaging & Communication Medicine), electronic-mail, HTTP (Hyper Text Transfer Protocol), and TELNET (Telecommunication Network).

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L6: Entry 1 of 6

File: PGPB

Jan 17, 2002

PGPUB-DOCUMENT-NUMBER: 20020007294

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20020007294 A1

TITLE: System and method for rapidly customizing a design and remotely manufacturing biomedical devices using a computer system

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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KIMC	Draw Desc	Image
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☐ 2. Document ID: US 6272470 B1

L6: Entry 2 of 6

File: USPT

Aug 7, 2001

US-PAT-NO: 6272470

DOCUMENT-IDENTIFIER: US 6272470 B1

TITLE: Electronic clinical recording system

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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KIMC	Draw Desc	Image
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☐ 3. Document ID: US 6018713 A

L6: Entry 3 of 6

File: USPT

Jan 25, 2000

US-PAT-NO: 6018713

DOCUMENT-IDENTIFIER: US 6018713 A

TITLE: Integrated system and method for ordering and cumulative results reporting of medical tests

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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KIMC	Draw Desc	Image
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☒ 4. Document ID: US 5655084 A

L6: Entry 4 of 6

File: USPT

Aug 5, 1997

US-PAT-NO: 5655084

DOCUMENT-IDENTIFIER: US 5655084 A

TITLE: Radiological image interpretation apparatus and method

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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KIMC	Draw Desc	Image
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☐ 5. Document ID: US 5513101 A

L6: Entry 5 of 6

File: USPT

Apr 30, 1996

US-PAT-NO: 5513101

DOCUMENT-IDENTIFIER: US 5513101 A

TITLE: Radiological image interpretation apparatus and method

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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PMC	Draw Desc	Image
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☐ 6. Document ID: US 5469353 A

L6: Entry 6 of 6

File: USPT

Nov 21, 1995

US-PAT-NO: 5469353

DOCUMENT-IDENTIFIER: US 5469353 A

TITLE: Radiological image interpretation apparatus and method

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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PMC	Draw Desc	Image
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<u>L3</u>	L2 and network\$3 same (manag\$3 or execut\$6) same (transfer\$6 or transmit\$6) same (data or fil\$3)	9	<u>L3</u>
<u>L2</u>	L1 and (exam\$ or terminolog\$6 or list\$3) same (description or describ\$3)	149	<u>L2</u>
<u>L1</u>	(display\$3 or imag\$4) same (ultra-sound or ultrasound) same (medical or hospital) same (computer\$6 or network\$6 or LAN or local area network or WAN or wide area network)	440	<u>L1</u>

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